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PAVING SEWERAGE

MUNICIPAL ENGINEERING

WATERWORKS PARKS

A MONTHLY MAGAZINE.

DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS, STREET CONSTRUCTION,
CLEANING AND LIGHTING,
SANITATION,
BRIDGES.

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Municipal Engineering

VOLUME XIV. APRIL, EIGHTEEN NINETY-EIGHT. NUMBER 4.

A SUCCESSFUL SUBSTITUTE FOR MUNICIPAL OWNERSHIP.

By Alfred F. Potts.

It is the purpose of this article to indicate a solution of the much vexed question as to how the people may both own and control street railways, water, telephone and light companies, which, by the use of the streets, become monopolies and receive their largest value from the increase of population and the natural growth of a city.

Many disinterested men agree that the people should control these enterprises, but shake their heads and offer weighty objections to the usual proposition of municipal ownership by which hundreds of places would be added to the already too long lists from which patronage may be promised as the price of political work. Theoretically, in the large things that affect our interstate or international relations we have a government "of the people, for the people, by the people," but when we come to the study of municipal government, Lincoln's great generalization shrinks to the form, "Government of the politicians, for the politicians, by the politicians." The recognition of this condition accounts for the slow progress of the movement for municipal ownership.

In our eager desire for improvements, for street car, electric and gas lighting, water, telephone, and similar service, we have turned our streets over to private corporations and so created monopolies with which there can be no practical competition. With the growth of the city ordinary business must meet with an increasing competition, which insures a constantly decreasing scale of prices; while these monopolies stand alone and with the increase of population reap an increasing harvest where they have not sown commensurately.

Any attempt to regulate the rates of charges by law may be unfair to either side. The rates may be so high as to be an imposition on the public, or may be forced to so low a point as to amount to practical confiscation. The exactly fair line is at cost. It will then never be necessary to reduce efficiency on the one side, or to complain of excessive profits on the other.

But this it will be said is only pointing out the desired end without suggesting the means of reaching it. I shall, therefore, briefly outline the plan of organization on which the Consumers' Gas Trust Company of Indianapolis was formed and give something of its history, believing that it furnishes a means by which the people may control these enterprises so as to reduce the price of such service to actual cost.

In considering the plan of or-

ganization the object to be accomplished was to secure the benefit to the people of natural gas in such a way that it could not be monopolized, and yet to keep the organization free from political control. The plan was as follows:

First. The creation of a self-perpetuating board of five trustees who hold no stock in any competing company. In case of a vacancy by death, or resignation, the vacancy is filled by the survivors. It is at this point that the utmost care should be taken in selecting men of such known character and public spirit that their very names constitute a guarantee of good faith and wise management. It may be taken for granted that if men of the right character are first selected that they will be sure to fill any vacancies which may occur in their number by the selection of men of equal rank with themselves.

This feature of self-perpetuation is believed by many to be a very important part of the plan. It is, however, unpopular with some, and in a new organization which is now forming for another purpose, this provision is modified so that the five trustees serve for definite periods, and their successors are appointed by the circuit court, or in the case of failure of the court to act, the remaining trustees fill the vacancy. Other methods for the election of successors will occur to any one preparing such a plan of organization, but that the self-perpetuating feature is the best method is believed by those who have given the most thought to the subject. It is opposed, however, by theorists, who point out that by such a method a group of trustees might perpetuate their own families or business connections. It is to overcome the possibility of such an undemocratic procedure that the change referred to is being made.

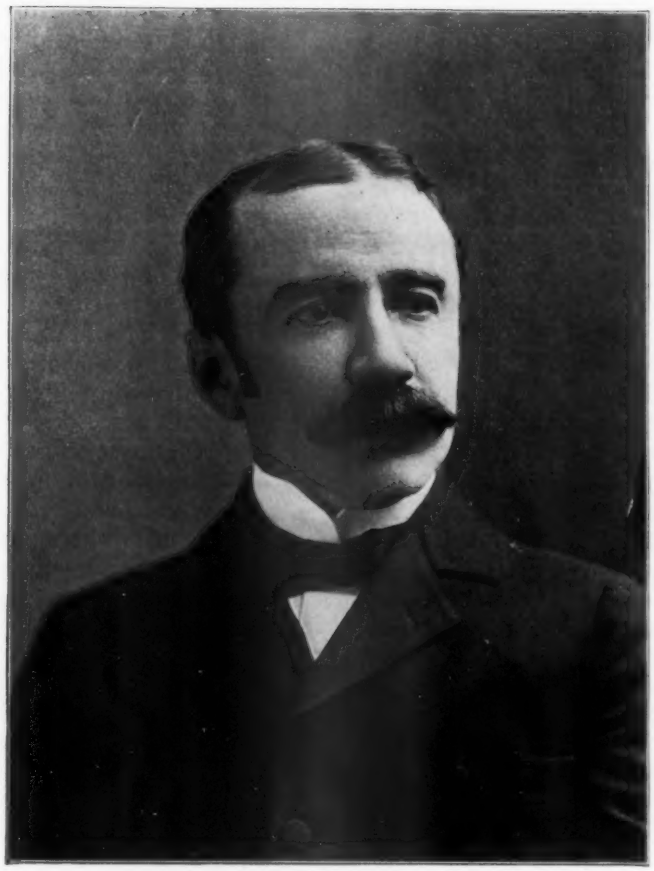
Second. In taking subscriptions for stock, the subscriber enters into a special contract by which the stock subscribed for by him is expressly transferred to these trustees, naming them, with an irrevocable power to vote the same for directors.

This provision does not, of course, limit the right of the stockholder to transfer his stock to any purchaser, but it erects a barrier against the possibility of any person, or corporation, adopting the usual method of getting rid of a competing company by buying up a controlling interest in its stock. Under such a plan it is unimportant who owns the stock, and though the entire issue might pass into the hands of one person, he could not elect a single director.

In some cases a provision granting an irrevocable power has been held invalid, but no thoughtful lawyer has ever suggested that, when this plan of organization, with its obvious purpose to promote the general welfare, is considered as a whole, any court would ever hold such a provision invalid. The legislature of Indiana, however, passed an act making this provision valid as to this and similar companies.

Third. As soon as the holders of stock, or their assigns, have received the face value thereof with eight per cent. interest, the service must be reduced to cost.

It is not a case where small dividends can be paid out of large profits and a surplus fund created to form the basis for watering, or the fictitious issue of stock for speculative purposes. The investor having got back the full amount invested, with eight per cent. interest, the profit from that time



A. F. POTTS.

Mr. A. F. Potts, who contributes the article on "A Successful Substitute for Municipal Ownership," in this number, is one of the leading lawyers of Indianapolis. He has been prominently identified with many important public undertakings, among the most notable of which is the Consumers' Gas Trust, developed from the novel plan evolved by Mr. Potts ten years ago for giving the public the largest measure of benefit from a particular kind of public service, while at the same time allowing a fair return to invested capital. The remarkable success of this enterprise is widely regarded as a practical demonstration of the great possibilities of the plan, as it may be applied to other kinds of public service belonging to the class of natural monopolies. The question of its applicability to other municipal enterprises is now receiving the consideration of Mr. Potts, and interest in the matter evinced in many of the leading cities has led him to write for MUNICIPAL ENGINEERING MAGAZINE the article on this subject which appears in this number.

goes to the public in the reduced price of the service. The investors are still the nominal holders of the stock, but are entitled to no dividends. The interest paid during this period has remained at home.

In the new plan, which is under preparation, are the following modifications, which I regard as important in the light of the experience of the Gas Trust Company:

First, a report to be filed with some city official of all the transactions of the company.

Second, a statement of all salaries paid to all officers and managers, which salaries must be approved by the trustees.

Third, a list of the stockholders and the amount held by each.

The reason for making such modifications has arisen from no just ground of criticism of the management of the existing company, but in order to forestall the possible criticism of the enemies of such an organization.

Of course, the buying and selling of corporate stock will always occur with any corporation, and its value will fluctuate. These conditions have nothing to do with the value of this plan of organization, because in the case of the Consumers' Gas Trust Co. it is a fact that every subscriber who through fear sold at a discount has been made whole many times over by what he has saved in the price of his fuel gas in these last ten years. The total saving to the city of Indianapolis through this organization has been not less than one million dollars per year for the last ten years. But as men of all classes are invited to take stock in such organizations every safeguard should be thrown around them which may be practicable to prevent speculators from taking any advantage of their ignorance.

A brief outline of the history of the Consumers' Gas Trust will show the practicable possibilities of the plan, which may be applied to other kinds of public service. When it was discovered ten years ago that Indianapolis must depend for its natural gas supply upon the territory lying from twenty to forty miles north of the city the Standard Oil Company at first undertook the enterprise of piping it to the city, but for some reason either sold out or allowed the nominal control to past into the hands of another company composed of local capitalists. Many at the time believed it was a diplomatic move in order to secure local influence, for as soon as the pipe line had been brought down to the city limits the company made a formal announcement that it could not go farther and that the city would have to forego the use of natural gas unless the rates which had been fixed by the city council were doubled. These rates had been fixed upon what seemed a fair basis and yet the people were so anxious to enjoy the great luxury of natural gas that there was a very strong appeal made for doubling the rates in order to have immediate results. Others, and by far the large majority, were, however, very indignant at the demand, and vehemently declared their willingness to burn coal rather than submit to such treatment. Public meetings were held and many co-operative plans were suggested, but nothing tangible took shape, though some good was accomplished in stirring up popular resistance.

At this juncture a prominent man from one of the gas towns came to Indianapolis proposing to organize a people's company, which had nothing more definite in it than the proposition to furnish the gas at the ordinance rates. He

readily gathered about him the public spirited men of the city who, acting on his assurances, went about securing contracts from prospective patrons. When he had secured hundreds of such contracts and his opposition began to look formidable he suddenly, between two days, lost interest in his own enterprise and disappeared from the scene of action. It was said that he left with a little bonus of $20,000 for his trouble. This conduct, which the volunteers in his behalf called treachery, but which he regarded as a little "stroke of business," only intensified the popular prejudice against the company seeking advanced rates.

It was at this time that I began to study the situation, hoping to devise some co-operative plan for the formation of a company which could not be bought off. I recognized that with the wealth behind the existing company it could afford to pay any sum necessary to secure a controlling interest in the stock of any competing company which might be formed in order to get it out of the way—that the doubling of the ordinance rates meant a difference of very little short of a million dollars a year. There was then the problem of how to make a stockholder, with the right to sell his stock if he chose, and yet deprive him of any power by such disposition to give his assignee any control of the company; in other words, to prevent the possibility of any of the manipulation by which competition is stifled. The main thought which came to me, and which was later embodied in the plan, was that this could be best done by placing his stock in the hands of trustees, with an irrevocable power to vote it for directors. The second consideration was to offer such returns on the stock as would induce investment in it and yet so limit it that a surplus would remain with which to pay back the original investment, that thereafter the service might be at cost. I covered these points in the subscription contract, by which the subscriber in signing for his stock placed it in the hands of trustees, who were named, with an irrevocable power to vote it for directors. It also expressly provided that any surplus above eight per cent. interest should be returned to the subscriber until he had received the full amount of his investment, after which gas was to be furnished to the citizens of Indianapolis at cost. Under this plan, while the stockholder remained the nominal owner of the stock, he had no control of the company. If a competing company, or any interested person, should buy up the entire issue of the stock he could not elect a single director, and so any scheme to stifle the enterprise would be rendered fruitless.

But while the plan was shaping up the season was advancing; many plans had been suggested and come to nothing. The people were rapidly reaching the conclusion that there was no escape from the monopoly which was standing at the council chamber demanding the doubling of the rates, and pointing to its pipes at the city limits, waiting to bring the comfort and luxury of fuel gas into every home. People were trying to argue that the double rates proposed were still not more than one-half the cost of coal.

While the matter was being agitated great pressure was brought to bear upon the city council for the passage of the proposed ordinance doubling the rates, and the plan proposed by me was publicly and violently denounced by those

interested as a visionary scheme, which would simply delay the introduction of gas and deprive the people of its benefits. At a special meeting called for the purpose of "railroading" the ordinance through the council I appeared at the head of an influential committee and presented my proposed plan of organization, and demanded that a few days' time be given to ascertain whether it would be indorsed by the financial men of the city and could be put into effect. These influences compelled the delay as requested, and we called a meeting of the board of trade, before which the plan was presented.

In the meantime, in order to test public sentiment, we began an active canvass among the substantial business men of the city, and succeeded in securing such letters of indorsement and subscriptions to stock that public opinion was rapidly formed in its favor. Colonel Eli Lilly and Mr. E. F. Claypool were the first leading financial men to lend it the aid of their subscriptions, each of them pledging himself to take $5,000 of the capital stock.

On Nov. 2, 1887, the articles of association were filed, and Judge R. N. Lamb was named as the president and I as the secretary. Headquarters were at once opened and an active canvass made throughout the entire city in order to secure popular subscriptions in amounts ranging from $25 upwards. Public meetings were held in every ward, which were addressed by friends of the plan, they often having to meet in a kind of joint debate the men in opposition who were trying to check the popular movement. Every ward was divided into precincts in charge of committees, who took subscriptions to the stock, and in a few weeks' time the first issue of stock, amounting to $500,000, had been subscribed.

When the work was done this stock was so scattered among the voters of the community, that no council dared to pass any regulation interfering with the movement. Work was begun at once in the gas field, and within a few months the people in Indianapolis were enjoying the blessings of natural gas at prices not exceeding one-third the cost of coal, and at an annual saving over what it would have cost had the rates been doubled of not less than $1,000,000.

In securing popular subscriptions to the stock, the company at the same time made sure of its consumers, who, in support of their own company, contracted with the Consumers' Trust Company to the exclusion of the other.

The stock was placed at $25 a share, payable in monthly installments, and was sold to hundreds of citizens in amounts ranging from $25 to $10,000; a total of $605,000 of stock was issued. In establishing the plant to supply the city it became necessary to borrow $750,000 at 7 per cent. interest. The stock runs at 8 per cent.

The rapid growth of the city has made a constantly increasing expense for the laying of more service pipe. In the meantime the gas pressure in the field has been rapidly diminishing, more wells have been necessary from year to year and the company has been compelled to push farther and farther into the field in order to secure the necessary supply. Pumping stations had to be built at enormous expense, and yet with all these extraordinary expenses, increasing from year to year and amounting to hundreds of thousands of dollars, this company has succeeded in paying off its $750,000 of

indebtedness and reducing the amount due to stockholders until at this time only $236,000 remains due. If natural gas holds out we will see the consummation of this enterprise within two or three years—fuel gas at cost. In the meantime no matter who has owned the stock the dividends have been limited to 8%.

The value of this institution does not consist alone in what it has saved to the citizens of Indianapolis, but in the larger view it presents a model upon which other organizations may be formed for the control of city franchises. That experience and discussion may lead to modifications that will improve the plan, I have no doubt. The main consideration in such an organization is to limit the dividends to some fixed rate of interest which will be a sufficient inducement to capital and yet not constitute a burden to the public, and second, that its management, while in the interest of the public, should be kept out of political control.

In many of the larger cities of the country these public franchises are beyond the control of the people. Here and there, however, they are expiring, and in many of the smaller growing cities of the country such franchises are still within reach. Wherever these conditions exist this plan of organization and its successful operation in Indianapolis may prove of interest.

The champions of municipal ownership will find in it a means of accomplishing that reform. In most cities municipal ownership is impossible because of the limit upon the indebtedness, and the inability of the city to raise the necessary funds for the purchase. A slight modification only is needed to make such an organization the instrument by which to acquire the property desired.

For this purpose the articles of incorporation as well as the subscription contracts should provide that after the stockholder has received the full amount of his investment, with interest, that the trustees and directors should then transfer the property to the city. And thus municipal ownership would be accomplished without any expense or the incurring of any liability.

THE NATURE AND ORIGIN OF ASPHALT.*

By Clifford Richardson.

The natural bitumen, which is known as asphalt, is composed, as far as we have been able to learn, of unsaturated hydrocarbons and their sulphur derivatives with a small amount of nitrogenous constituents. Asphalt may, therefore, be defined as any hard bitumen composed of unsaturated hydrocarbons and their derivatives, which melts on the application of heat to a viscous liquid; while a maltha or soft asphalt may be defined as a soft bitumen, which, on heating, leaves an asphalt, or becomes by natural causes converted into one. The line between the two classes can not be sharply drawn.

Asphalts are distinguished by the large amount of sulphur they con-

* Extract from article in *Journal of the Society of Chemical Industry*, London, January, 1898.

tain, and it is to its presence that many of the important characteristics and perhaps, in part, the origin of this form of bitumen is due. The soft asphalts or malthas contain much less sulphur than the harder ones, or, if the former are rich in sulphur, they are then in a transition stage and will eventually become hard. But a small portion of the constituents of a hard asphalt are volatile even *in vacuo*, but they can be separated by solvents into an oily portion, which is soft, or softens readily when heated, and a harder portion, which does not melt by itself without decomposition, and is a brittle, solid, but soluble in the oily or softer portion. The harder and least soluble portion always contains the larger part of the sulphur. It seems, therefore, that sulphur is the effectual hardening agent of natural asphalts, in the same way that it is of artificial asphalts which are produced by heating a soft natural bitumen with sulphur.

The portion of asphalt soluble only in chloroform or carbon bisulphide is entirely absorbed by sulphuric acid, showing that it contains no paraffines or saturated hydrocarbons.

That portion which is soluble in naphtha can be, to a great extent, volatilized *in vacuo*. The lighter constituents are found to be largely unsaturated hydrocarbons of at least two classes—those absorbed or converted into tars by sulphuric acid, and those but slightly acted upon by it, together with sulphur compounds partly precipitated by mercuric chloride and partly recoverable from their combination with sulphuric acid by steam.

The hydrocarbons absorbed by sulphuric acid, and converted into tars by it may belong to several series, less saturated than the C_nH_{2n}, and it is probable that some of them, or their derivatives, are aromatic or cyclic compounds. Nothing further is known of them at present. Those not easily acted upon by acid are of very high density, and refractive index for their boiling point and molecular weight, and correspond in no way with any saturated or open chain hydrocarbons. They are evidently cyclic hydrocarbons similar to the naphthenes, but having an even greater density than these, as far as they are known, for the same molecular weight. The amount of these comparatively stable hydrocarbons unacted upon readily by sulphuric acid varies in different asphalts from comparatively little to 30 per cent. or more. In the malthas there is a still larger proportion. The greater part of an asphalt bitumen is, therefore, of unsaturated and unstable bodies liable to constant change, while even the most stable constituents, the cyclic hydrocarbons, are slowly polymerized on standing.

Asphalt is in the process of formation to-day. It plainly does not originate as such, but is a secondary product, resulting from the transformation of lighter forms of bitumens, malthas, or even thinner oils, into harder bitumen by condensation and polymerization, a reaction in which sulphur seems to take an important part.

Asphalt is probably derived from unsaturated hydrocarbons, although the condensation of paraffine hydrocarbons by sulphur, or of a mixture of saturated and unsaturated hydrocarbons in the same way, would yield unsaturated hydrocarbons as products, but would require a high temperature. Polymerization would probably take place more readily in the unsaturated series.

No high temperature seems necessary for the change once initiated, as it is seen going on to-day in the Trinidad Pitch lake, and in Venezuela. Gas is commonly evolved, and is largely hydrogen sulphide, the natural result of the condensation of hydrocarbons by sulphur. Carbonic acid accompanies it, which would seem to point to a reaction between hydrocarbons and inorganic sulphates, and the latter as the source of the sulphur in the bitumen of asphalts, but this is only theory based on the presence of sulphates in the water emulsified with Trinidad pitch, while there is quite as much hydrogen sulphide given off by the Bermudez asphalt, which contains no water or sulphates as it originates.

Whether its origin is in sulphates or inorganic sulphides or whether, as suggests itself, it is derived from the same substances, either animal, vegetable, or inorganic, from which the hydrocarbons themselves are formed, it is plainly an important factor in the production of asphalt and especially the harder ones.

It seems justifiable, therefore, to suggest that where mineral oils, composed of unsaturated hydrocarbons, originate under such circumstances as to be subjected to conditions favorable to condensation and polymerization, asphalt will be formed, not necessarily immediately, but in the course of time.

For the primary origin of asphalt one must, of course, go back to that of petroleum. This subject has lately been discussed at length, and both experiments and arguments brought forward in favor of the animal or vegetable origin of petroleum or its inorganic derivatives. Recent scientific journals are filled with the literature of the question, so that it will not be necessary to summarize the reasoning here, but merely to add such suggestions, derived from the results of our investigations, as may be utilized in favor of one or the other theories.

The presence of nitrogen in all the asphalts examined may be considered, by those advocating the animal or vegetable origin of petroleum, as confirming their views, but it seems possible also to account for it from an inorganic source.

The theory of the general origin of all mineral bitumen in a base of unsaturated hydrocarbons, suggested by Heusler, seems to be supported by the unsaturated nature of the constituents of the asphalts and malthas; but on the other hand, the formation of saturated hydrocarbons from the unsaturated oils of Trinidad asphalt by the action of aluminum chloride, has not yet been confirmed.

The thermal origin of the bitumen of Trinidad lake asphalt is strongly suggested by the presence of a thermal water, containing borates and iodides, in an emulsion of definite composition with bitumen and mineral matter, while the transportation of bitumen from place to place by means of springs is illustrated by the mineral spring which rises at the center of the Trinidad lake with the freshly issuing pitch, and to the collection of bitumen in pockets, even under the sea where springs break out. In no case, however, have any signs of more than normal temperatures been observed in any of these springs. Steam, therefore, if an element in the movement of bitumen, must be associated with it at such a point as to indicate a thermal origin of the bitumen itself.

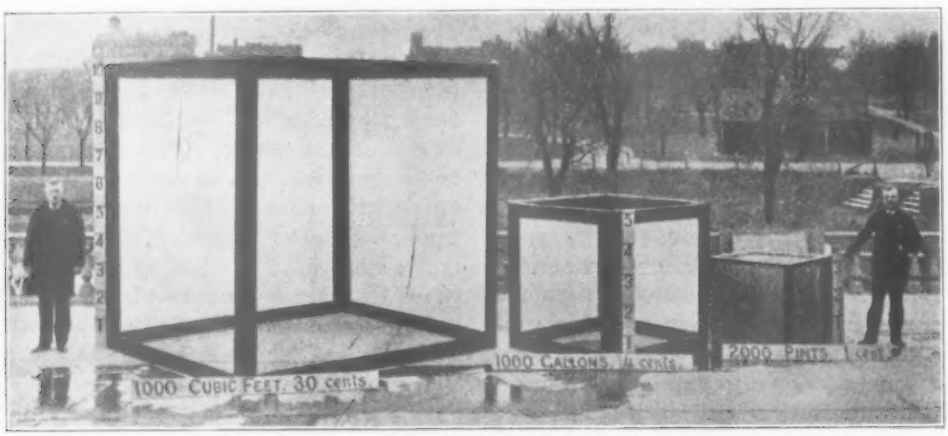
Finally, the theory of Ochsenius that the formation of petroleum is to be attributed to the action of

strong salt solutions on organic matter, might also be considered as strengthened by the presence of such a strong brine accompanying the emulsion of soft asphalt in the Trinidad lake.

These suggestions are given for what they are worth as slight contributions to the knowledge of a subject which is still far from being understood. My own investigations have been confined simply to a study of the nature and origin of asphalt, the importance of sulphur in its genesis and the effect which it has upon its character.

COST OF WATER BY METER MEASUREMENT.

The cry of "selling water by the pint," with which water-works officials are familiar wherever the meter system is introduced, has been met very effectively in Philadelphia by Mr. John C. Trautwine, Jr., chief of the water bureau, who has given the public a very good object lesson by constructing three



"WATER BY METER AT ONE CENT PER TON."

cubes containing respectively 1,000 cu. ft., 1,000 gallons, and 2,000 pints of water. These he has had photographed as shown by the accompanying illustration. The prices of these different quantities of water are shown in the illustration. "Water by Meter at One Cent. Per Ton," is the title given to the picture.

In no city in America is there greater need of restraint in the waste of water than in Philadelphia, and there is no better means of doing this than by application of the meter to consumption. It is the equitable method of selling water. Under it the small consumer pays only for what he gets and is not compelled to pay a rate that shares the expense of the large wasters or users of water. The general use of meters would probably easily reduce the waste of water in Philadelphia one-half and would largely reduce unnecessary expense in connection with the water supply. Mr. Trautwine's object lesson may be serviceable in many other cities where there is needless waste of water.

DURABILITY OF A BRICK PAVEMENT.

By Harry L. Weber, C. E.

It is a law of nature that can not be disputed, that every demand, silent or spoken, brings its supply of the thing wished for in proportion to the intensity of the wish and the growing numbers so wishing, who, by the action of their minds upon some one subject, set in motion that silent force of thought not as yet heeded in the world's school of philosophy which brings the needed supply. Millions so wished in silence for the means to travel more rapidly, to send intelligence more rapidly, and the thought brought the steam and electric car, the horseless carriage, the bicycle, the telegraph and telephone. With these improvements came the thought, then the demand for better roads, following this demand came the supply in asphalt, brick and other pavements.

We have in Richmond, Indiana, at the intersection of six streets, a piece of brick pavement, laid on concrete foundation of six inches, with pitch filler, put down in 1891.

BRICK PAVEMENT ON N. E ST., RICHMOND, IND.

It is practically in as good condition to-day as when laid. I found on December 23, 1897, by actual count, that there were passing over this intersection 175 vehicles of all kinds, making an average of 184 tons per hour. Of course this was a busy season, but I submit the following which is an average of two days, December 28 and 29, 1897, of eleven hours each, which I consider below a fair average day's traffic, on account of the weather and the time being just

after Christmas. I give the traffic for each hour from 7 A. M. to 6 P. M. and give the kind of vehicles. I estimated the weight of these vehicles and verified them by the weighmaster at the scales of Irvin, Reed & Co. The estimates were as follows:

Single pleasure vehicle, including horse and occupants	1,300 lbs.
Double pleasure vehicle	2,500 "
Trucks, etc., single, empty	2,200 "
" " " loaded	4,000 "
" " double, empty	3,500 "
" " " loaded	6,000 "

You will notice that all figures are for an eleven-hour day, and do not include bicycles, pedestrians and vehicles that pass during the night, from 6 P. M. to 7 A. M. All this passing is thrown in for good measure.

Over this street passes daily 75 tons of freight to one of the freight houses of the P., C., C. & St. L. Ry., and has been doing so ever since it was laid. In these six years there has passed over it 141,000 tons of freight to this one point alone, which practically means that many vehicles to this one place of business. I venture to say that amount does not include ten per cent. of the tonnage passing over this intersection, and that 1,923,000 vehicles would not exceed the amount passing over this piece of pavement in this period. On the days above mentioned, December 28 and 29, 1897, there passed on an average 878 vehicles each day, which would indicate that at least 320,000 vehicles pass over this intersection annually. It has not cost one cent for repairs in these six years, nor does it need any at present. Twelve years will be a low estimate of its life. If this street has withstood this enormous traffic for six years, and has not cost one cent for repairs, and does not need any now, it looks reasonable that twenty years is a fair and conservative estimate to put on the life of a brick street in any small city where care is taken to compel water and gas companies, and sewer contractors, when they tear up a street, to replace it in proper manner.

TABLE OF TRAFFIC OVER BRICK INTERSECTION AT NORTH "E" AND EIGHTH STREETS, RICHMOND, INDIANA.
December 28 and 29, 1897.

Kind of Vehicle.	TIME OF DAY.												Weight of Traffic in Pounds.	Total Number Vehicles.
	7 to 8 A. M.	8 to 9 A. M.	9 to 10 A. M.	10 to 11 A. M.	11 to 12 A. M.	12 to 1 P. M.	1 to 2 P. M.	2 to 3 P. M.	3 to 4 P. M.	4 to 5 P. M.	5 to 6 P. M.			
Pleasure—single	25	35	28	45	51	27	47	53	62	76	34	482	526,500	482
Pleasure—double	2	3	1	6	2	7	1	2	5	3	2	34	85,000	34
Truck—single, empty	7	16	18	15	9	6	12	17	20	15	6	141	297,000	141
Truck—single, loaded	5	9	6	10	3	2	2	9	8	2	0	56	224,000	56
Truck—double, empty	5	3	5	17	19	7	12	9	18	18	7	110	860,000	110
Truck—double, loaded	5	2	6	7	6	8	6	9	8	8	0	55	330,000	55
Totals	49	68	64	100	90	52	80	99	116	111	49	878	1,823,000	

Total number of tons, 911.5 in 11 hours.

LOSS OF WATER FROM PIPES.*

By F. H. Crandall, Supt. of Water-Works, Burlington, Vt.

The determination of the loss of water from any considerable system of underground piping is at best problematical and does not admit of definite unquestionable solution, but in the case which I will endeavor to present for your consideration some of the difficulties ordinarily encountered have been eliminated. Systems, even of such small extent as that to which your attention is invited, on which for months at a time there is no occasion to open public fire hydrants, on which there are no large manufacturing concerns using water for fire purposes, and on which all ordinary legitimate use is metered, are not numerous. On the Burlington high service, however, it has recently come about that these conditions obtain.

By far the larger portion of the pumpage on this service is accomplished by a motor, an auxiliary steam plant being used only when, for one reason or another, it becomes necessary. The works were built in 1880 and 1881, and now supply the university buildings, the State Agricultural Experiment Station and its farm buildings, two Roman Catholic schools, one hospital and five summer residences, with innumerable fixtures, besides 45 dwellings, nearly all of which are supplied with modern conveniences in plumbing. Some of the mains were laid in rock cut, and some are, for the greater portion of the year, below the ground-water level. No more than the usual amount of trouble has been experienced from them since. The work was not contracted. The service comprises an iron tank of 2,260 cubic feet capacity, 9,671 feet of cast iron mains from 4 to 8 inches in diameter, and about 1,560 feet of 4-inch cement mains, with six public fire hydrants, one 4-inch and two 2-inch services supposed to be used for fire purposes only, 62 metered taps, through which water is used for domestic purposes, one 3-inch metered elevator service, one 2-inch overflow, metered, and one 1¼-inch metered service used to supply power for operating valves of the motor. The meters in use on the service are of the Crown, Nash, Empire, Bee, Lambert, Union Rotary, Union Piston, Disc and Trident make. Each of the meters used on the service at the time of setting, registered on full size ⅛ and 1-16-inch streams not more than 2 per cent. fast nor more than 3 per cent. slow. By sizes, the meters in use are one 3-inch, two 2-inch, two 1½-inch, seven 1-inch, seven ¾-inch, forty-one ½-inch, and five ⅜-inch.

As the discharge of the motor is conveyed to the tank by way of the distribution system, and thus far conditions have not been favorable for accurate measurement, the losses in the pump can be got at only by estimation. The plunger in the pump end of the motor, which works against about 41 pounds static and 43 pounds dynamic head, is 4 7-16 inches in diameter, and is provided with a double cup leather packing, which has frequently been found, when the plunger is not in motion, to be absolutely tight at different points of the stroke. In motion, a small leakage is devel-

* Read at the February meeting of the New England Water-Works Association.

oped. There is also leakage of the ports, and, though at different times when the motor has been opened for repairs, the high service pressure being applied on the pump side, there has been no leakage noted through the leather-packed stuffing-box between pump and motor, in practice there must be some leakage at this point. The leakage through this stuffing-box, between the pump and motor, can not conveniently be separated from that through two 10-inch gates under the low service pressure, about 5 pounds. All three together have frequently been found to amount to less than 1 per cent., and in different tests it has developed that reliable information is not to be obtained from the measurement alternately for equal intervals of the total leakage and that from the gates alone, as the leakage of the two gates alone was often in excess of that of gates and stuffing-box taken together.

The suction and discharge ports of the motor pump are each twelve in number, about 3 inches in diameter, and capable of ½-inch lift. The motor runs at from 4 to 32 strokes per minute, and will not run many minutes at the maximum speed. The average is about 12 strokes per minute.

Besides the losses common to all pumps, a further source of error in the counter measurement in this case is the shortening of the stroke on small streams like that in small meters, and which in this case reaches at times 3 per cent. of the stroke. It is not, however, expected that in practice the motor will be required to run for any considerable length of time on a very small flow.

In the endeavor to obtain some idea of the tightness of the pump plunger when in motion, motion was imparted to it when under pressure, by means of a rod threaded for the full length of the stroke, and operated through a threaded hole in a bar bolted across the opening made by the removal of the cylinder head. The motor is supplied with a regular pump counter, and the record of its strokes is probably as accurate as is generally obtained. The pumpage of the steam plant was, perhaps, not as accurately determined. It was taken to be the increase in depth of water in the tank during the time of its operation, which usually took place at times when there was little or no consumption.

The records for the two periods into which the total period may be divided, during one of which the steam pump was used and the average daily consumption was about 4,770 cubic feet, and during the other where the steam pump was not used, and the average daily consumption was about 3,552 cubic feet, do not differ materially in the percentages not measured.

In taking statements of the meters recording the consumption, about two hours are consumed, and the counter of the motor is read during that time. For very short periods the pumpage during the time of taking statements and a slight variation of depth in the tank tending in the same direction would have a noticeable effect, but for long periods any error which could arise from these causes is so slight as to be neglectable.

In determining the correction to be applied to the counter record for losses on the pump, taking the leakage of the ports at the mean noted during several tests, made under static pressure, that of the plunger at the mean noted while moving with considerable less than its usual velocity against the static

pressure and that of the stuffing-box at an arbitrarily chosen amount equal to one-half that of the plunger, we have an aggregate loss, under the conditions noted, of about 1 per cent., and for purposes of estimation, we will assume the losses under working conditions at 5 per cent.

Records are at present obtainable of the pumpage and consumption on this service for a period of eleven months, during which every legitimate use of water, except such as made by the water department, was supplied through meters. During the period under consideration there was no occasion for the use of water for fire purposes on the high service.

During the first eight months for which records are kept the steam plant was called but five times. The total amount of water handled was 1,144,907 cubic feet, 1,088,563 cubic feet, or about 95 per cent. by the motor, as per indicator, and 56,344 cubic feet, about 5 per cent., by the steam plant, determined as before stated.

Of this indicated pumpage

729,282 cu. ft., about 64 per cent., was metered to consumers.
193,285 cu. ft., about 17 per cent., was metered to motor.
39,040 cu. ft., about 3 per cent., was metered to overflow.
27,630 cu. ft., about 2 per cent., was estimated to consumers.
57,245 cu. ft., about 5 per cent., was the estimated loss in pump.
93,425 cu. ft., about 9 per cent., not accounted for.

During the last three months for which records are obtainable, the steam plant was not called upon at all. The total amount of water handled was, as per indicator, 319,734 cubic feet. Of this indicated pumpage

230,375 cu. ft., about 72 per cent., was metered to consumers.
40,360 cu. ft., about 13 per cent., was metered to motor.
1,680 cu. ft., about 5 per cent., was metered to overflow.
2,024 cu. ft., about 5 per cent., was estimated to consumers.
15,986 cu. ft., about 5 per cent., was estimated loss in pump.
29,309 cu. ft., about 9 per cent., not accounted for.

During the entire periods for which records are available, eleven months ending February 1, 1898, the total amount of water handled was 1,464,641 cubic feet, 1,408,297 cubic feet, or about 90 per cent. by the motor, as per indicator, and 56,344 cubic feet, about 4 per cent., by the steam plant, determined as before stated. Of this indicated pumpage

959,657 cu. ft., about 65 per cent., was metered to consumers.
233,645 cu. ft., about 16 per cent., was metered to motor.
40,730 cu. ft., about 3 per cent., was metered to overflow.
29,654 cu. ft., about 2 per cent., was estimated to consumers.
73,232 cu. ft., about 5 per cent., was the estimated loss in pump.
127,733 cu. ft., about 9 per cent., not accounted for.

NEW HIGH-PRESSURE FIRE SERVICE SYSTEM AT PROVIDENCE, R. I.

Providence, R. I., has generally been supposed, on account of the large size of its water distribution pipe and the abundance of its water supply, to be well protected against fire. An independent high-pressure fire service system, however, has been recently installed there, consisting of very large pipe, which is not to be used for any purpose but fire protection, and no connections of any kind whatever, except those of the hydrants of the service, are connected to the pipe of the system.

The average static pressure in

the mains of the new fire service system is about forty-four pounds more than it is in the pipes of the low service at the same elevations.

The high-pressure fire service system was completed last October, and it seems to give great satisfaction to all concerned. The insurance rates have been considerably reduced within the district which it protects, and it was demonstrated at a large fire last December (in the opinion of the fire commissioners and others) that it practically paid for itself during this fire, as the conflagration was kept within the

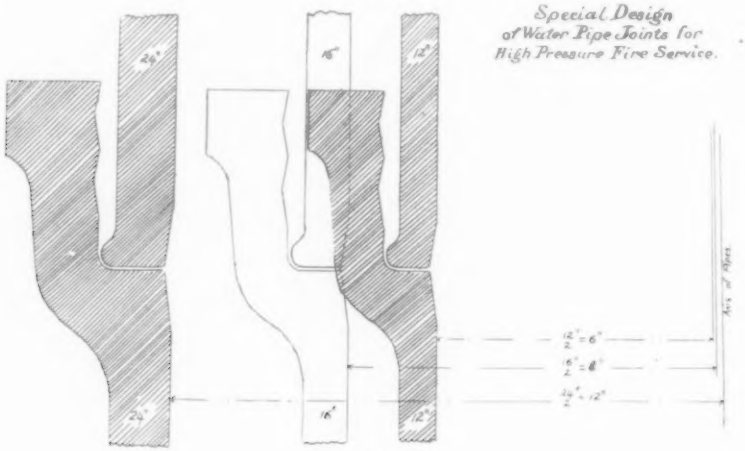


FIG. No. 1.

walls of the building in which it originated by the aid of the new fire service; otherwise it might have spread over a large area and caused a great additional loss of property.

The area of the new fire service district, which is principally located in the center of the business portion of the city, is about one-half of one square mile.

The supply of water is taken from the Fruit Hill high service reservoir, 24-inch main, at a point a little more than three miles from the reservoir, the water line of which is 274.75 feet above *datum*.

The total length of the pipe of the high pressure fire system is 29,409 feet, namely: 4,189 feet of 24-inch pipe, 23,004 feet of 16-inch pipe and 2,216 feet of 12-inch pipe. To this pipe are connected 89 hydrants.

The static pressure at the hydrants ranges from 116 to 85 pounds per square inch, according to the location of the hydrants. The pipe is of such large size that under ordinary conditions the pressure will not fall below 100 pounds per square inch in the center of the business portion of the city when an average rate of 5,000,000 gallons per 24 hours, or 3,472 gallons per minute, is being drawn from the pipe. Arrangements have also been made so that in the future, if it should be desired, a stationary pumping plant can be connected to the pipe of the fire system and the pressure raised 50 pounds more per square inch than the pressure is at the present time.

At a test in the center of the business portion of the city, soon after the system was completed, a stream of water was discharged from a 2½-inch ring nozzle to a vertical height of about 137 feet, while the water was flowing at the rate of about 950 gallons per minute.

The total cost of the system was about $139,749, or about $4.75 per lineal foot.

The pipe was laid 6.25 feet deep, which is about 1.6 feet deeper than the depth of the ordinary water pipe, in order to pass under the water pipe and other obstructions that were already in the ground, as well as a precaution against the freezing of the water in the pipe of the fire system, which would be more likely to occur on account of its comparative stagnation. As an additional safeguard against freezing, a by-pass has been located between the fire service system and the low service, and three blow-offs are connected at convenient points.

For more than four months during the past winter the gate of the by-pass into the low service has been opened a few turns, allowing a discharge of about 40,000 gallons per 24 hours into the low service, and every morning, during the same period, two blow-offs have been opened about fifteen minutes, allowing a discharge of about 1,100 gallons, in addition to that passing through the by-pass. The circulation in the fire system produced by these discharges has prevented the minimum temperature of the water from falling 37° during the winter.

The expense of laying the pipe was considerable, on account of its being principally laid in paved or macadamized streets, on account of its unusual depth, which necessitated generally the sheeting of the trench in which the pipe was laid; and in some cases very bad quicksand was encountered, which necessitated the dumping of coarse gravel into the bottom of the trench in order to secure a satisfactory foundation for the pipe.

Fig. No. 1 shows a section of the pipe joints, which have a double groove for increasing the resistance of the lead which was used for calking the joints. These joints were especially designed for the fire service pipe.

Plan showing manner of securing Curved Pipe of High Pressure Fire Service.

FIG. NO. 2.

Fig. No 2. shows the method followed in securing the curved pipe of the system having an angle of more than 10 degrees. As will be seen from the plan, collars, lugs and screw bolts were used. This method of securing the curved pipe, which was also especially designed for the fire service system, has given great satisfaction, both on account of the quickness with which the work could be done and the security of the same after it was completed.

It should be remembered, as has already been mentioned, that in designing and doing the work a much larger increase of pressure was an-

ticipated in the future. An increase of pressure, however, is not probable, for at least some time to come, as the pressure at the present time is eminently satisfactory to the fire department.

The special designs mentioned above for the system were made under the personal direction of Mr. Edmund B. Weston, M. Am. Soc. C. E., engineer in charge of the Providence water department, who also directed the construction work. The loss of head due to the friction of the water flowing in the pipe, which was based upon what it will be after the pipe has been ten years in service, was computed by a new formula, dependent upon the age of the pipe, which was constructed by Mr. Weston.

NOISE ON BRICK PAVEMENTS.

Among the questions discussed at the recent annual meeting of the National Brick Manufacturers' Association in Pittsburg was, "How can the element of noise on brick pavements be obviated or minimized?" The immediate answer of Mr. D. V. Purington was, "By rubber tires." The discussion which followed is given below:

Mr. C. H. Merrick, Syracuse—In a conversation with Mr. Jas. L. Breed, the manager of the New York Brick and Paving Company, of Syracuse, he spoke of this point the other day, and among other things he said that he believed, in fact he was satisfied, that the rumbling noise coming from a brick pavement was caused by the shrinkage of the cement under the brick; that the pavement is so frequently laid quickly over green cement, as we know, it shrinks more or less, leaving a small space under the brick pavement, thereby making the rumbling noise as the vehicles pass over it. It struck me as being very reasonable. I know of the workings of cement as a builder, and I know that there is more or less shrinkage; and when he gave me this idea, I said "You are right; that is the cause." The remedy in his opinion and mine is that the cement when put down should be left until thoroughly dry. Then place your pavement over it, and you will get rid of a large amount of noise, if not all. Then you will have a pavement which will give as little noise as the asphalt.

Mr. Carmichael, Wellsburg, W. Va.—I desire to ask a question of the convention. Do not our city officials clean our streets too clean? In other words, would we not have better results on the paved streets, as to the life of the pavement and the deadening of noise, if a quarter of an inch of dirt were left on the street?

Mr. D. V. Purington—There is no question about that. One of the unfortunate things is that the very thing we are trying to get rid of is one of the chief inducements for advocating brick pavements. I have not thought of the matter in the light suggested by Mr. Merrick, and I am not sure but what there is something in it. It is one of the things we can not get around—that brick pavement is noisier than wood or asphalt. We have laid in Galesburg, Ill., quite a large amount of street paving during the past year—single course work—just the red clay graded, with a coating of sand, and the brick on that. We

have had some down two years, which has retained its form, and the pavement is as perfect as any we have had anything to do with. In driving over that pavement I have noticed that there is a difference in the metallic ring, over even the two course work. We have no concrete foundations. All the other pavements have a flat course for the foundation and the edgewise course on that, and there is a difference in the noise; it is not a great deal, but enough to be noticeable. Driving off one piece of pavement, with two course work, on to the other with the clay foundation, it is a great deal more quiet. It is altogether possible that there is something in the suggestion as made by Mr. Breed in regard to the noi-e.

Mr. T. A. Randall, Indianapolis —I have had an experience along that line myself. I live on a brick-paved street. The first block or brick pavement in our city went down on our street. It was laid on concrete foundation, with nothing but a thin layer of sand between the concrete and the brick pavement. I am confident—though it has not been taken up to demonstrate it — that the concrete has shrunk from the brick, and the curbs have held the brick in place, and the shrinkage of the concrete has caused a hollow space beneath the brick. There is a roar from the pavement which is objectionable, and it is these things which hurt brick pavements in the estimation of the people. I believe if the paving brick men will see to it that the brick are laid properly, that brick pavements will become more popular in large cities as well as small ones. Mr. Carmichael says if the streets were not kept so clean the noise would not bother any one. But they are kept clean. We in the large cities are getting more fastidious and exacting every year and keep our streets clean as we never did before; consequently complaint is made of noisy pavements. It seems to me that if brick are laid in a thick bed of sand there will be little or no rumbling. The pavement I refer to is literally a sounding-board and is very objectionable, solely because of the noise. Otherwise it is perfectly satisfactory. It has been down six or eight years, and is as good, almost, as when first laid. I am confident that, as Mr. Merrick says, the cement foundation shrank away from the brick, leaving a hollow space between the brick and concrete. The space between the brick was filled with cement, which I think makes a noisier pavement than a sand filler.

Mr. W. A. Eudaly, Cincinnati. —I saw a street in Columbus, Ohio, exactly as Mr. Randall represents his street—the concrete had shrunk away from the brick, and immediately on vehicles striking that part of the street there was a roar, while on another part of the brick-paved street it was not so. I have not yet got to the point where I am willing to admit that streets paved with brick are noisy. I do not admit that. If you put a sounding-board under them, it is the sounding-board that is noisy. The brick are not noisy.

Mr. A. Ittner, St. Louis.—I think Mr. Randall gave the true solution of this trouble, but did not give entirely the cause. Now, I have ridden over brick streets that sounded exactly like a drum, but it never occurred, as far as I am advised, unless it was frosty weather. My idea is that perhaps in the brick themselves there is expansion, and if it be not expansion in the brick themselves, the street is always made with a certain amount of

curvature. It is different in different cities. My theory is this—the brick are laid against the curbstone, and the earth under the sidewalk or the earth between the sidewalk and curb when it freezes expands, and, of course, it expands towards the roadway from each side, and as this expansion takes place in the earth, it crowds up the pavement in the street. The tendency of the pavement is to go up, because it has a crown shape. I believe that is what causes the rumbling. It is only, so far as my experience goes, in the winter time that this rumbling sound occurs.

Mr. Eudaly—I do not understand Mr. Ittner's philosophy in stating that the frost produces expansion. I thought it was heat that produces expansion.

Mr. Ittner—I think that freezing expands the earth; that is my judgment; the earth being damp causes the expansion.

Mr. W. R. Cunningham, Frankfort, Ind.—I think it is due to expansion, and that city engineers should make allowance for expansion of the earth, the same as engineers do in erecting iron structures.

Mr. J. H. Chambers, Philadelphia—I have knowledge of pavements in Wilmington, Del., laid as Mr. Randall describes, but in addition to that the upper course of brick was covered with liquid cement, which ran into the interstices between the brick. The noise was very evident both winter and summer. The city engineer suspected that the cause was what Mr. Randall has surmised, and he took an opportunity to have the street broken to examine the pavement, and he found that the concrete preparation had sunk away from the upper course of brick.

Mr. D. V. Purington.—There is one thing in regard to the noise, which has occurred to me many times—I find wherever I have been accustomed to use brick pavements that the interstices, if they are filled with sand, the noise is much less than where they are filled with pitch or cement, for the reason that the pavement becomes homogeneous when the latter is used. When pitch or cement is put in there is a resonance which you do not obtain when each brick is imbedded in sand. For that reason I certainly favor sand, above asphalt or pitch, because in the course of two or three years evaporation takes place and disintegration occurs and nothing is left of the asphalt or pitch but a residuum of resin. The engineers who provide for a pitch filling are making a mistake, and also some of them who are specifying cement. It would also be difficult to make this division as Mr. Randall suggests, with sand, for the reason that the sand fills up the space between the two bricks; and I do not believe there would be any more room for expansion with the space filled with sand than with cement or tar.

Mr. Eudaly—I believe everyone who has handled cements must know that you can put down cement, or concrete as we speak of it, and let it stand and it will shrink. In many of our pavements they put in the cement or concrete and immediately follow it with sand or brick, and the cement is going to get away from it. I do not want to suggest how long to wait. Suggestions like these are not always to our interests. The sooner we stop discussing this question the better it will be.

Mr. D. V. Purington—I do not agree that there is anything in this subject that can hurt us. We are after the best pavement, and if there is anything that can be brought out by this discussion

which will suggest an improvement in the way of avoiding or lessening the sound that is what we want.

Mr. Eudaly—That is a different thing entirely. And, for fear that I may be misunderstood, I will say that cement will continue to shrink for several weeks. If concrete is allowed to set as it should set to make the best concrete it should have several weeks to do it.

Mr. Chas. A. Bloomfield—I know that the earth under the sidewalks will absorb moisture, and under those circumstances they will expand. Frost and heat do not have the same effect on all substances. You may take that in the case of your watch which you carry in your pocket. There is in that watch a compensating balance composed of two metals; the heat affects one and the frost the other, and they are combined so that in case of either cold weather or warm weather they will act against each other to prevent contraction and expansion. It is the same way with regard to the earth and other substances. Mr. Ittner is right when he says that the earth under the sidewalk will expand, and it is for the reason that in the fall of the year the earth absorbs moisture and the frost throws it out of line, and it raises the street in the center and produces a hollow space under the pavement.

Mr. O. N. Townsend, Zanesville, O.—After the remarks of Mr. Purington I will give our side. We are contractors as well as manufacturers and are interested in having brick pavements used as much as possible. If they are going to make a noise we will not have so many used as if they were not noisy. Our experience is that the square-edge brick pavement does not make as much noise as the round-edge pavement. If brick-makers would advocate the use of a filler which is not so rigid we would have less noise, no matter what the foundation is. Sand filling is cheap and not so rigid and with it you will not hear the noise so much. Tar filling is the same thing. When you have a rigid filter-like Portland cement you will have the noise, whether you use a stone or concrete foundation.

Mr. Purington—Have you, in Zanesville, two main streets paved with brick, one of which has a sand filler and the other a cement filler?

Mr. Purington—It is that particular case that I had in mind a few minutes since. Some years ago I went to Zanesville, and reached the city at two o'clock in the morning. It was in June or July. As we walked along the sidewalk there came along a carriage driven rapidly and I was struck with the metallic ring of the horses feet, or, as Mr. Carson would say, "the 'ammer of the 'oofs on the 'ard 'ighway." There was a ring which could be heard for a block. We were not on the street on which the hotel is situated. We went on to the next street and there came along another carriage which made an entirely different noise. There was a dull thud, a sound which we did not hear on the other street, and I took occasion the next morning to see what made the difference, and the only difference that I could see was that one was a sand filler and the other a tar filler.

Mr. L. J. Howard, St. Louis—I wish to state that this noise on the street is not confined to brick pavements alone. Near my house is a wooden pavement and the street cars run over the wooden pavement and they make so much noise that you can not hear persons talking ten feet away from you. It sounds like a heavy train of cars running over a bridge.

A METHOD OF TESTING CEMENT.

[At a recent meeting of the Western Society of Engineers, the president, Mr. Thos. T. Johnston, introduced a discussion on a method of testing cement which had just come to his attention. His remarks are given below:]

Dr. Pruessing, the manufacturer of the Hemmoor cement in Germany, is going over the United States examining, as far as they will permit him, the manufacture of Portland cement, and incidentally he is advocating a new wrinkle in the methods of testing cements, that to me is quite interesting. It is a new form of conducting the test known as the "hot test." His method of procedure was to take a given weight of cement and mix with only six per cent. of water, six per cent. of the weight of cement, and water added to the cement, barely dampening it. He put the mixture into a cylinder with a metal plate at the bottom, and subjected it to a very high pressure. The cylinder he had was perhaps three and one-half inches in diameter, and he aims to get the total pressure, twenty-five atmospheres, as he stated, on that area. That has the effect of pressing the cement into a cake about 3½ inches in diameter, and about ½ inch thick. That he places on the shelf in the laboratory for twenty-four hours. Then he puts it on a metal plate, perhaps ten inches square, or less, and about one-sixteenth inch thick, placing that over a Bunsen burner, the cake being immediately over the burner. He places the bulb of a thermometer over the top of the cake, and supports the outer end of the thermometer on any convenient rest, and lets the temperature rise to 180 degrees centigrade, which is way above the temperature used in the ordinary hot tests, something like 360 degrees Fahrenheit. When the cake has reached that temperature, he commences putting cold water on it, such as you would draw from the faucet ordinarily. His method of doing this is by use of a pipette, holding a gill of water, from which he sprinkles the cake until the water ceases to evaporate rapidly from it. That being done, he allows it to dry out, still over the Bunsen burner, and then he examines it. If there are any signs of cracking in the cake, it is not good cement, and if it is intact, and is not affected at all by that process, he thinks it is reasonable to assume that the cement is good. At least there is an absence of those elements which are met in the cement which tend to make the cement bad. It is a little interesting to know that a prominent manufacturer of cement is not only an advocate of the hot test, but of such a very rigid test as that which Dr. Pruessing is using, where the temperature is raised so high, and the cold water put upon it at the high temperature.

The hot test, I believe, is used by all manufacturers of Portland cement, although a great many have maintained that it is not a good test, or a fair test, to subject a cement to, prior to using it in any work. A good many engineers view the matter in the same way. It seems to me that, in the present state of the manufacture of Portland cement, at any rate, there is very little determined by the tensile strength. The fact that the cement will hold together and show a greater or less strength in seven days is very far from being a conclusive test that the cement is good, or that it should do so in twenty-eight days or even in a year, or in

any length of time. Some incident or circumstance varying from that under which the particular specimen of cement had hardened might cause its destruction. I know one instance that has happened in the course of our sanitary district laboratory work that illustrates the point. We had a specimen of cement that developed very great strength in seven days, in twenty-eight days and in three months. It was a specimen which had originally been rather quick setting, so quick setting that it was not used in our work, although we retained a sample of the cement and tested it. We found that a large majority of the briquettes which were broken at the end of three months would entirely disintegrate with a variation of 100 degrees temperature, Fahrenheit. That cement might have lasted indefinitely at the ordinary temperatures.

Now, I do not know of any other way, not even by chemical analysis, that we could have determined whether that cement was a good or a bad cement, except by the use of the hot test, and where such a slight variation of temperature as 100 degrees Fahrenheit would cause its destruction, I think it could hardly be called a safe cement, or that it could be put on the market indiscriminately. In cold weather we might want to use hot water in the cement; we might want to put it where a steam-pipe is located, or perhaps in a number of years the elements would decompose, and that might destroy the cement. It is better to have a cement that would stand the hot test, because the hot test develops the fact that there are constituents in the cement that easily decompose under a comparatively small variation of temperature. The tensile strength of a cement does not develop those elements. It may be a very strong cement in seven days, and, without being molested, may go to pieces at the end of the year. We have run across cements of that kind. There is one piece of work that was done in the city of Chicago about two years ago that I know of. It was not on our work; it was on another piece of work; but we happened to get hold of some of that cement and test it, and as far as tensile strength was concerned, and its behavior in the briquettes, it behaved very well. But in the particular piece of work into which the cement went, the concrete disintegrated in the course of several weeks. That particular piece of cement was probably charged with free lime, that hydrated very slowly, or certain aluminates of lime, the silicate of lime having hardened and given the concrete strength before the dangerous elements commenced to act, and when they did commence to act, then the whole mass went to pieces. We all know that free lime, free magnesia and certain forms of the aluminates of lime, in cement, behave a great deal in the same way. Now, those are elements which may not be determined chemically. We know that there are lime, silica, aluminum and magnesia in cement, but the exact forms in which they exist in the cement can not be determined by chemistry. We know by taking a cement which is known to be good and mixing into it lime that has been formed at very high temperatures, or magnesia, or certain forms of the aluminates of lime, that they are made bad cements. All cements contain the constituents to make those particular combinations. Now, it seems to me that if tensile strength, or the fineness of the cement, or its rate of setting, or even irregularity

in rate of setting from time to time, fail to develop these elements, and if the hot test will develop them, why is not the hot test a good test? Why should it not be applied to all Portland cements, particularly those that are to be used in important works—for instance, in concrete under the pivot pier of an important bridge, where you could not get at it to remedy it, if bad. If a portion of a sidewalk should fail, you can get at that and fix it easily enough. There has been a good deal said, one way or another, about the hot test, and a good many have thought it was not a fair test to make, but I can not quite understand their philosophy.

A prominent manufacturer of natural cement remarked, in a conversation I had with him recently, that engineers are driving the natural cement makers to a practice which he doubted the advisability of, and it will probably lead ultimately to a weaker cement than otherwise could be made. It is a fact that in burning the natural cement there is danger of its being underburned somewhat; not enough to destroy their cementitious nature in a short period of time; not enough to destroy it in a long period of time; but still, being underburned, they will show greater unit stress in a short period of time than if they are more fully burned, and it sometimes happens that they will show cementitious value in a week or ten days that will be entirely absent at the end of the year. That may be the result of calling for high tensile strength in seven days. In natural cement overburning will not destroy the reliability of the cement or the durability of it. It will show somewhat less strength in seven days or twenty-eight days than cement that is underburned, but in the long run will hang together more surely; it will always be a good cement. If it is overburned too much you just add some inert matter to the cement that will not have a deleterious effect in a long time, although it will not be as strong as it would be if properly burned. That suggests the question as to whether or not the engineers are not making a mistake in calling for a high tensile strength in seven days in natural cements. We have one cement, perhaps, that will show seventy-five pounds in seven days; another one that will show one hundred and fifty pounds, and another one that I know shows over two hundred pounds. The manufacturer makes it two hundred pounds because he thinks the engineers like it best, but in comparing some of the work of the cement compared with cement showing lower tensile strength in seven days, it has not seemed to be as good. I asked this particular manufacturer to suggest a specification that would remedy that trouble; he promised to do so, and I understand it will be forthcoming in the course of time. If he keeps his promise I will try to lay it before the society.

Mr. J. B. Rohrer—I wish to make a suggestion as to what might be made to cover that point. According to your remarks, the cement that was underburned gave a higher tensile strength and depreciates gradually, and the one overburned would be a slow-setting cement and would not positively attain the maximum strength that it would if it were properly burned. I would suggest that your specification require a stated rate of increase of strength between seven and fourteen days or seven and twenty-eight days.

The President—It appears to me

that that would be a good suggestion if the time could be taken to make such long tests.

Mr. Rohrer—You could produce the same thing if tests were made from one to seven days; that is, you may get a ratio after the experiments were made.

The President—Yes, that might develop a method. I will say that it occurs to me, if the manufacturer of natural cement took kindly to the idea, that it might be well to specify the limits of seven days' strength, say not less than seventy-five and not more than one hundred and twenty-five to one hundred and fifty pounds. A specified high limit of strength, as well as low limit, might be better than to say "not less than one hundred pounds in seven days."

Mr. Rohrer—In that hot test that you speak about, that is, 180 degrees Centigrade, what effect did the water have upon that briquette? Did it show any cracks at all?

The President—No.

Mr. Rohrer—In your experience with the Sanitary District, what proportion of water did you use in making cement briquettes?

The President—That is a matter of some interest. The American Society specifications, which were written some years ago, have called for 20 to 22 per cent. Portland cements, but we find in the wide range of Portland cements that are being now made, that if the cements are fairly good the proportion will vary from as low as 15 per cent. to as high as 24 per cent. to get an even degree of plasticity in all of them. We have run across some of the Portland cements, which of course were rejected, that have taken as high as 36 per cent. of water, which is decidedly abnormal. There are factories in the Lehigh Valley, Indiana, Michigan, Dakota, Arkansas, Denver, Salt Lake and elsewhere, and there is just as much difference in the cements as there is in butter or cheese.

Mr. Rhorer—Regarding the practice of using just a small quantity of water and just putting it in as needed, I suppose the idea is that the small quantity will fill the interstices in the cement and will have the same effect as the large quantity.

The President—The idea advanced by Dr. Pruessing is that he asserts that good Portland cement (and I assume he is referring entirely to German cements) will not take up chemically but two per cent. of water during the first twenty-four hours. As he makes his water less than 6 per cent., his idea is only to supply as much water as will be taken up chemically.

Mr. Rohrer—According to the test that he makes, putting water on that piece and it not cracking, it looks as if he had attained the best kind of material for fireproof purposes. Being heated to 180 degrees centigrade and then having cold water applied, looks like the best kind of fireproofing.

The President—It is an extraordinarily rigid test, and there are a great many of our American cements that will not stand it.

A Member—Supposing you reverse that test, subject it to intense cold and then put hot water on it?

The President—That would only have the effect of developing, it seems to me, whether or not the cement would resist the sudden expansion and contractions that would develop, due to sudden change of temperature. In heating the cement, they reduce the lime or magnesia or the other decomposable substances to a condition that will

enable them to readily hydrate; they will take up water at once and expand, that is, the process is to facilitate; it is a phenomenon that might happen if a cement is one, two or three years old. Reducing the temperature would not have that effect, as I understand it.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

FORMULA FOR CROSS-SECTION OF BRICK AND STONE PAVEMENTS.

On page 169 of the number for March, 1897, the formula for cross-section of brick and stone pavements is indistinct. Will you kindly repeat it, and state whether it applies to granite block or macadam pavements? *Stanley Ruffin, Boston.*

The formula in question should read:

(1) $C=\frac{w\ (20-i)}{1600}$, for stone, wood and brick pavements, in which

C is the crown of the pavement in feet above a line drawn from gutter to gutter,

w is the width between curbs in feet, and

i is the longitudinal gradient in feet per 100 feet.

For asphalt streets the formula is

(2) $C=\frac{w\ (9-i)}{600}$.

The first formula applies to block pavements. If i is zero, the crown in the first formula becomes $\frac{1}{80}$ the width, and in second case $\frac{1}{67}$ the width. The usual crown given to macadam pavements is about $\frac{1}{60}$ the width. In many cases the crown is the same as that for asphalt. The crown of macadam streets is fixed by different considerations than those for hard paved streets. In the first place, the water must be thrown to the gutters, especially if the longitudinal gradient of the street is steep and repairs are not made with such frequency as to prevent the formation of ruts. Frequent changes in the gradient are desirable to cause the water to leave such ruts. In the second place, the cross-section should be level enough not to require the concentration of traffic on a narrow width in the center. These two requirements conflict to some extent, but the first is of no consequence when the roadway is kept in proper repair. A street on a level should have a well rounded cross-section. Perhaps, the best form of cross-section for macadam streets gives about three inches fall to fifteen feet from the center and five inches more to the gutter, which should be about four feet wide and paved with material which will not easily wash out. See the answer to Mr. Horace Andrews' question.

CROWN OF STREETS WITH VARIOUS GRADES.

I am unable to see any adequate reason for making the crown of a street dependent on the longitudinal slope of the street, and to attempt this is to try a most unpractical thing. For example, what would you do with the crown where a 2 per cent. grade runs into an 8 per cent. grade by means of a vertical curve with continual change of grade? I find that the same crown will work on all grades if the opposite sides of the street are of the same level; if not, the only resource will be to bring the gutters as nearly to the same height as is practicable, and if the street has then a very considerable cross slope, more than 3 per cent., say, the crown must be removed almost entirely, preserving only enough to avoid the appearance of sag or hollowness in the centre.

Horace Andrews,
City Engineer, Albany, N. Y.

This question refers to the matter of a variable crown depending on the longitudinal slope of a street, referred to on page 140 of

the number for March, 1898, and to the formula for the same given on page 168 of the number for March, 1897. The writer has never used the formula in practice and does not understand that Mr. Rosewater, who proposes it, adheres to it strictly. The question of its practical application has been referred to Mr. Rosewater, and it is hoped that he may find time to describe the details of its application. Experience with the conditions in Omaha demonstrates that a material flattening of the crown on the streets with steep grades is very desirable. When the longitudinal slope is more than 6 per cent. (on some streets in that city it is as high as 8, or even 10, per cent.), the combination of longitudinal and transverse slopes, with the usual cross-sections, makes a material increase in the difficulty of travel down the hill in unfavorable weather, and a horse which is not driven exactly on the crown of the street finds it difficult, and even dangerous, to stop or to proceed. The flattening of the crown is of much assistance to the animals. It also distributes the rainwater running down the street, so that there is less danger of overflow of gutters and washing of lawns, there being few or no sewer inlets on these hill streets. This latter would be a point against the proposition in Albany, where sewer inlets on the street corners on the hillsides are numerous. It is probable that Mr. Rosewater does not follow the formula strictly in such cases as that mentioned by Mr. Andrews, but uses it as an indicator of the desirable crown for a given longitudinal slope and approximates the strict crown where slopes are changing.

The writer prefers for most streets a form of cross-section similar to that recommended by Mr. Andrews in his excellent chapter on "City Surveying," in Gillespie's "Higher Surveying," edited by Cady Staley, which has recently been issued from the press of D. Appleton & Co. He would make the depth of gutter from 6 to 7½ inches, according to width of street, and longitudinal slope, and the ordinates to the curve of the street from a straight line drawn from curb to curb would be:

$\frac{3}{32}$ of the crown at the curb.
$\frac{1}{8}$ " " $\frac{1}{8}$ the width of street.
$\frac{3}{32}$ " " $\frac{1}{4}$ " "
$\frac{1}{2}$ " " $\frac{3}{8}$ " "
0 at the center of the street.

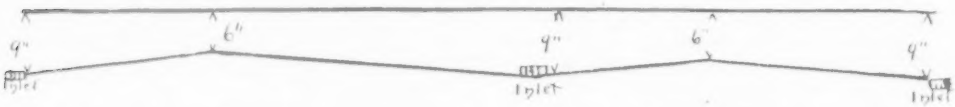
This is a form composed of two inclined straight lines connected by a curve.

For streets of very flat longitudinal slope, the writer prefers a circular arc for the cross-section, with the following ordinates to the straight line drawn from curb to curb, as given by Mr. Andrews in the chapter above referred to:

$\frac{3}{32}$ of the crown at the curb.
$\frac{1}{8}$ " " " $\frac{1}{8}$ the width of street.
$\frac{3}{32}$ " " " $\frac{1}{4}$ " "
$\frac{1}{2}$ " " " $\frac{3}{8}$ " "
0 at the center of the street.

This form gives better drainage to the flanks of the street, which is absolutely demanded on the flat streets of many cities located on level ground. In fact the writer has been obliged to introduce variable cross-sections and catch-basins in the middle of blocks to secure drainage in some cases. For example, on a block over 500 feet long in which the difference of level between the two ends was less than three inches, the curb lines and the line of the center of the street were run through as straight lines. The depth of gutter varied from 6 inches to 9 inches, so that the face of the curb showed as in the sketch, the upper line being the line of the curb and the lower line that of the gutter. Such construc-

tion requires additional work in staking cross-sections and testing concrete surface, but is not otherwise difficult to construct:



Other expressions for crowns and cross-sections are given on page 104, March, 1897, and page 366, June, 1897.

COST AND CAPACITY OF ELECTRIC LIGHT PLANTS.

I should like to have some information in relation to the cost and capacity of an electric light plant suitable for a town of about 3,000 people.

Charles P. Frank, Duluth, Minn.

The answer to this question depends upon many items. For example, is the plant to furnish street lights only, or commercial lighting, or both; is it to be a municipal plant or private ownership, arc or incandescent, or both? The figures given must therefore be indefinite. The cost would probably lie between that of Gainesville, Ga., $8,000 for 50 arc light capacity; Painesville, O., $12,000 for 85 arc light capacity, and Batavia, Ill., $25,000 for 4,500 incandescent light (16 c. p.) capacity. Crocker's "Electric Lighting" may give the basis for the determination of the desired cost.

STATISTICS OF VITRIFIED BRICK PAVEMENTS.

Please advise me if your files during and since 1894 furnish the information necessary to bring down to date the statistics of vitrified brick pavements given in Wm. P. Judson's work on "City Roads and Pavements."

Walter S. Church, Geneva, N. Y.

The following list of articles and tables gives the location of the information on this question appearing in MUNICIPAL ENGINEERING since February, 1895. Also, an itemized statement of the cost of a brick pavement in Memphis may be found on page 56, February, 1894.

Judson's table is given on page 294, June, 1895; Troy plans and cost on page 303 of same number; the cost in various cities on page 234, October, 1895; the cost of brick and other pavements on page 236, April, 1896; the average cost of brick pavements on page 96, August, 1896; the cost of single course brick pavements on page 22, October, 1896; a large table giving the amounts of various pavements and the cost in many cities on page 18, January, 1898.

EFFICIENCY OF FLUSHING SEWERS WITH FLUSH-TANKS.

Where can I find an article which treats of the efficiency of flushing sewers with flush tanks, stating the distance and effect produced in sewers of different sizes?

Ernest Adam, Newark, N. J.

A review of Adams' "Sewer Flushing Diagrams" is given on page 170 of MUNICIPAL ENGINEERING for September, 1897, in which a general statement of the results of his experiments and of the experiments of Mr. A. Rosewater is given. The diagrams themselves will give the details. Mr. Rosewater has kindly placed the results of his experiments in Omaha and Denver at the disposal of the writer, and a statement of them will be prepared for early publication. Given the size and gradient of sewer, capacity and rate of discharge of tank, the velocity and depth of flow in pipes without obstructions can be computed with considerable accuracy by Kutter's formula. In connection with the

facts observed by Adams and Rosewater, a table of such velocities and discharges would enable the engineer to predict the action of the flushing stream in a pipe under conditions varying from those which have been observed. Mr. Rosewater has prepared such a table for publication in a volume of tables he has in preparation and has given permission to print it in connection with the article mentioned.

Professor A. N. Talbot reports the action of a tank with 800 gallons capacity at the head of 5,000 feet of 10-inch pipe sewer, with a fall of 0.13 feet per hundred as sufficient to cause a flow 3 inches in depth at 2,000 feet, and 2½ inches at 4,000 feet, from the flush tank, the velocity being a little greater than would be expected from theoretical formulas.

CONCRETE FOUNDATIONS IN RELATION TO STREET GRADES.

We have a street 32 feet in width, with street railway in center, very light traffic and a steep grade for one-fourth mile. Is a concrete foundation necessary on account of the steep grade, if it is not needed on more nearly level portions?

A. M. Fuller, Meadville, Pa.

It is assumed that a concrete foundation is not needed on the level portions of the street. This conclusion is frequently reached without sufficient evidence, the reduction in first cost overbalancing the probable increase in cost of maintenance and the annoyance of unevenness in surface, when the first cost is so much nearer the eye that it obscures the vision of the other items. It is also assumed that the soil has not been properly drained and prepared for the pavement, since the chances are large that this is true. Washing out of the sidewalks and culverts, and consequent undermining of the street by water from areas outside the street surface, is as likely in one case as the other. It will affect the pavement less if the foundation is of solid concrete, and the repairs will be more readily made and the settlement after repairs will be less, unless the damage has been excessive. If the soil is light it is less likely to be washed out by water from the pavement, because it is not possible for the water to reach the subsoil through a concrete foundation properly laid. If the soil is clay, or is underlaid by clay or sand likely to be saturated with water, so that it is liable to slips, these will be less likely to occur, side drainage having received proper attention, with a concrete foundation. A washing out of the sand under the brick on a concrete foundation, on account of water getting under the brick at the street car track, or elsewhere, would have little or no effect on the foundation, and could be easily repaired, while the same accident might destroy the entire foundation and cause serious trouble if it were gravel only. The gravel foundation can not be so thoroughly compacted on the steep grade, and much greater care must be taken in laying it. More frequent changes in character of subsoil are to be expected on a hill-side than at its foot or on its top. Where there are such frequent changes a concrete foundation is always advisable. Most of the reasons that may be advanced for a concrete foundation on the hill may be grouped together by saying that the requirements of the hill-side are more rigorous than those of the level, and the decision not to use a concrete foundation should be reached only when the soil is materially better than would

be considered safe on the level. The amount of traffic has little to do with the decision if the subsoil is really good enough to make the question of a concrete foundation properly a debatable one.

[By J. W. Howard, B. L., C. E., for MUNICIPAL ENGINEERING.]

ASPHALT BLOCK AND BRICK PAVEMENT.

Is asphalt block pavement on a 32-foot street, with railway in center, likely to prove as satisfactory and lasting as a brick pavement?

A. M. Fuller, Meadville, Pa.

From a careful examination of asphalt blocks, as now made, with crushed trap-rock instead of crushed limestone, all things considered, including cleanliness, quiet, durability, eventual repairs, etc., for a long term of years, the asphalt block pavement would probably prove more satisfactory than most brick pavements as actually laid. But if a brick pavement could be laid under the supervision of experienced engineers, unbiased by other interests than their duty, it would be possible to select a grade and quality of brick pavement which would be as economical and lasting as asphalt block pavement. The cause of the inferior brick pavement lies in the low prices which brick manufacturers and contractors bid to secure work, and the use of inferior brick, below the highest tests, as well as the neglect of details of foundation and pavement construction to the detriment of the best results. The asphalt blocks, being manufactured at but a few points, have been improved each year. This has been necessary in order to retain and increase their market.

BIDDING BY DISCOUNTS.

What is meant by bidding by discounts?

M. W. Simpson, Philadelphia.

This is the system followed in connection with the letting of large standard contracts in France as well as in a few other countries, and just beginning in the United States. It completely stops unbalanced and "straw" bids. The government, state or person desiring bids, publishes a list of the materials and work desired and by tabulating each material, composition or kind of work, separately, and by placing opposite each the price per pound, cubic foot, or other unit of measure, for which it is well known that the above articles can be supplied, with a small and reasonable profit, standard prices are thus indicated. The bidders are required to name the several discounts, at which they will furnish each, or the per cent. to be added to each of the specified standard prices, and at which they will furnish that which is required.

For example: If a city, in connection with paving, should name the price per cubic yard for grading, square yard for concrete of a given thickness, square yard of the pavement of a given thickness and material, the bidder would name the per cents to be added or subtracted from the prices named by the city. He might offer to take the grading at the price named by the city less 20 per cent., the concrete less 5 per cent. and the paving plus 4 per cent.

Bidding by discounts is an excellent system and should be introduced more largely in connection with public contracts for sewers, water-works and other improvements. It not only compels city officials to be more familiar with the practical details and items and all that which enters into public improvements, but helps to elimi-

nate influence, politics, and kindred irregularities and much dishonesty from public works.

ASPHALT FOR RESERVOIR LININGS.

Is asphalt of value to make a city reservoir water-tight? Our reservoir leaks at about 150,000 gallons daily. In common with other taxpayers I object to paying for pumping this water into the reservoir to have it run to waste. The impression is that the leaking increases a little. The water injures some property near the reservoir. *A. T., Columbus, O.*

Asphalt concrete, as used in several parts of this country, is succeeding very well, and better with each new reservoir so treated. It should be laid over the bottom and interior sides of the reservoir. The price, if possible, should be so adjusted that the interest on the cost of the asphalt coating should be much less than the value of the water lost before the improvement of the reservoir. The specifications should be carefully drawn by one of the many engineers now familiar with this form of making reservoirs water tight.

LAYING SEWER PIPES BELOW NEW PAVEMENTS.

Would you advise the laying of sewer pipes with house slants or connections before paving a street? Our soil is clay and limestone formation. This seems practicable to insure a good pavement. Some of the city councilmen think otherwise. *O. M. H., Cambridge, O.*

It is best to lay the main sewer lengthwise the street before paving with granite, asphalt, brick or any standard pavement. It is not necessary to put in house connections, except where houses actually exist or are reasonably sure to be built within a few months or a year. The laterals or house sewers can be put in place and a pavement replaced in good condition at any time, by doing the work properly.

Your soil should be replaced without water. The best rule is to ram the soil in place about and above the pipe in layers of a foot each, using four men with rammers to one with a shovel. Plumbers and passing laborers should not be permitted to replace the earth in trenches over which a standard pavement is to be properly relaid, unless a trustworthy person is present and actually directs the consolidation of the replaced earth, clay, or other material. Flushing with water can only be permitted in very sandy soil; and even then is likely to result in future injury to the the pavement above, caused by subsequent settlement due to the drying out of the water, which, though slow, almost invariably happens, sometimes as late as nine months after the work is completed.

SYRIAN ASPHALT.

What is Syrian asphalt? Where obtained? What is its value? *E. B. C., Newark, N. J.*

It is a glance pitch of high luster used in the manufacture of varnishes and japans. It comes from near the south-east portion of Asia Minor, near northern Palestine—modern Syria. It enters the European and American markets by way of Marseilles, France. Its substitutes are certain glance pitches from Barbadoes, Cuba, Utah, and elsewhere. There are various grades, worth from $30 to $90 per ton. The consumption is small, being about 1,000 tons per annum in the United States, in connection with varnishes, paints, and various uses. It has no connection with paving, and although sometimes referred to in the paint trade as "asphaltum," it is, properly speaking, a glance pitch, Gilsonite, Uintaite, Grahamite, and others of the various grades of brittle bitumens, belonging to the same general class. Some of them have

been tried in connection with paving, in order to increase their consumption.

SAVING WATER AT PUBLIC DRINKING FOUNTAINS.

Before introducing an ordinance to stop the loss of water by the constant overflow at drinking fountains or troughs, will you kindly inform me if drinking fountains are practicable, so arranged that there will be no overflow or loss of water when the fountains are full, and such that they will automatically fill to a required level?

Chas. O. Mott, Zanesville, O.

There are many public fountains at which people, horses and dogs drink in many large and well-regulated cities, and which do not waste water. The portion for the horse-trough is closed automatically when full. This also governs the dog-trough placed at the side or rear, and on the same level with the horse-trough. The portion where people drink can either be allowed to run very slowly, or be arranged with a lever depression valve, which, when pushed down, permits water to run as long as held. Horse-troughs in many cities, by constant overflow, produce an enormous waste of water, as well as causing the neighborhood of the trough to be unsightly and unhealthy. There are several different competing makes of automatic drinking fountains. In this connection it is wise to caution against the granting of the right to adjacent saloons or other properties to have water-troughs for horses, even if metered. It is not an injustice to public comfort and tax-payers to compel several interests to combine on one trough at one point, and not allow more than one drinking trough within several blocks of another. They are often established in the interest of private persons, and against public policy. Public fountains for man and beast should be placed at reasonable intervals at public expense in all cities.

BY WAY OF COMMENT.

Mismanagement of Municipal Affairs in Philadelphia.

The political history of the Philadelphia gas plant includes its deterioration under the management of machine politicians in the interests of the party "heelers," themselves, and possibly the corporations, and the leasing of the property to an enormous gas trust company, not the bidder, offering the best terms. The public steps in the transactions have been such as to give rise to many accusations of peculation, fraud and bribery, and there have been some definite statements made, which, if capable of proof, should bring about the annulment of the contract.

The success of the gas trust has made the men who have been trying for years to obtain possession of the water plant more active in their efforts. Again, the failure of councils to manage the revenues of the department in a business-like manner, but rather to allow or force the deterioration of the plant, even with a surplus revenue of nearly $1,000,000 each year, which could be applied to its improvement, and their refusal to heed the reports of the faithful heads of the

department, have brought the works to a condition which makes plausible the contention that the city can not legally raise enough money to make the improvements now demanded, but must permit a private company to do it. As in the case of the gas plant, there are several propositions, including one by public spirited citizens, to take at the end of a contract period the proceeds of a sinking fund obtained by placing at interest the amount which the city can legally raise at this time, and in return supply within three years the plant to furnish the amount and quality of filtered water required. As in the former case, the project most favored, apparently, is not the one offering the most favorable terms to the city. Neither is it the one offering the best service. In fact, the source, both as to quality and quantity, is very doubtful, and the price demanded of the city amounts in the end to a sum many times that for which adequate provision can be secured.

The plan proposed by the Schuylkill Navigation Company is the one just now under special consideration by councils. It proposes the payment by the city in the fifty years' term of its franchise of $57,500,000 for works which, it is stated, will cost about $30,000,000, and, in addition, the city pays the cost of cleaning and maintaining the filter beds. The chief of the bureau of water reports that the storage capacity tributary to the system of filter beds proposed is utterly inadequate to the demands of the city for fifty years at present rate of increase, so that other measures for the supply of water or the restriction of waste must certainly be taken at great additional expense before the franchise period has expired.

A study of the use of water by the city, made by Chief Trautwine, shows that the consumption of water per capita in each census year since 1860 has been 36, 54, 68, 132 gallons, respectively, and in 1897, with an estimated population of 1,200,000, was 215 gallons. It is evident from these figures that the waste of water has rapidly increased in the city. Now that the filtration of the supply has been decided upon, simple business principles demand the reduction of this waste to a minimum. There are several ways of reducing it. Mr. Trautwine suggests the introduction of meters, demonstrated to be a most satisfactory system. The present total consumption can be kept uniform or reduced by the application of some method of detecting and restricting waste until the population is nearly twice what it is at present. With the $3,000,000 which the city can borrow at the present time, and the surplus revenue of $1,000,000 a year, Mr. Trautwine is certain that the machinery for the restriction of waste can be set in motion and the filtration of the entire necessary supply to the city provided for within a

reasonable time, say ten years, at a total expense not far exceeding $10,000,000. The application of business principles to the problem demonstrates the substantial accuracy of the estimate. The only condition lacking is the willingness or ability of councils to permit the practical application of these plain business principles.

Municipal ownership and operation is not the cause on trial in Philadelphia. The real question at issue is the ability of an American city to govern itself, and to withstand the assaults of men interested in securing for their own benefit the vast patronage and revenues accruing to the management of these municipal industries, and, if reports in the daily journals are to be credited, capable themselves or through their agents of any action necessary to bring votes to their propositions. Political manipulation by the managers of the plants is not eliminated by the transfer to private hands. It is only made easier, more profitable to the stronger leaders (whose hold on the plants is made more secure), and more easily concealed from public observation. It is much more dangerous on these accounts. It is more difficult to reform, because of its greater secrecy and the business contracts which can not be lightly set aside, while corruption in municipal operation can be exposed and corrected at least for a time when it becomes unbearable to a majority of the voters.

Standard Cement Tests. The Committee of the American Society of Civil Engineers on the Proper Manipulation of Tests of Cement has sent a circular asking about eighty questions regarding methods of testing cement to every member of the society, and to many others. Prof. George F. Swain, Massachusetts Institute of Technology, Boston, Mass., who is the chairman of the committee, will be glad to send copies to every one who has anything to add to the store of knowledge and results of experience in the testing of cement.

Some of the questions follow and others will be presented in these columns later.

All the questions are asked apparently with the assumption that each engineer has but one method for all cases. Many will doubtless reply, giving their most rigid methods only, but it is desirable that they should also give their short and ready methods used in cases of emergency or in keeping daily watch on the quality of the cement in use, either with or without simultaneous series of more elaborate tests to prove the quality more certainly. A suggestion of this sort would not have been out of place among the questions.

With reference to securing samples the questions are, (1) how much cement is accepted on the results of a single sample on various kinds of work, and what effect has the reputation of the cement on the amount so accepted; (2) what is the method of obtaining sample,

and (3) are samples from different packages mixed or kept distinct?

Chemical Analysis is disposed of with three questions; (4) when is it essential or desirable; (5) what elements should be determined; and (6) how. It would have been well to ask opinions regarding the indications of these results for various kinds of cement, methods of manufacture, etc.

Microscopical Tests are also disposed of very quickly by (7) when, if ever are they of value, and (8) what power of microscope, what observations, and what are the indications.

Fineness is more detailed, requiring six questions; (9) sizes of mesh for natural and Portland cement, giving size of wire used; (10) diameter of screen; (11) amount in sample; (12) what form and manipulation of shaking machine, if any; (13) shaking, how long continued; (14) difference in manipulation for different screens and kinds of cement. Another question of some value would be as to the means of determining the proportions of the various sizes and the desirability of checking up the sum of the quantities of the various sizes with the original quantity.

Weight per cubic foot is noticed with two questions (15) what is its value; (16) what apparatus for determining and how used.

Specific Gravity has the same two questions numbered 17 and 18.

Standard Sand questions are not quite as detailed as is desirable. Nineteen asks whether natural sand or crushed quartz is recommended; and (20) the fineness and variation in size of grain. Here a difference in practice for tests of various degrees of detail and for various purposes is often made, and the answers to the questions should show these differences. Some will fail to note the differences as the questions do not call attention to them.

Preparation of pastes and mortars is fully covered by (21) should there be same method for each test; (22) how should proportions be stated; (23) how specify and secure specified consistency; (24) temperature of materials; (25) temperature of air; (26) quantity of water; (27) method of mixing; (28) hand or machine and the method of manipulation; (29) what machine is best and what form is suggested for trial; (30) what machine gives good results, manipulation, advantages and defects; (31) is continuation of mixing defined by time or character of mortar. The questions concerning definition of proportions of cement, sand and water, could be elaborated somewhat, to give methods in detail, if by measure or by weight and for various purposes. There might also be a question regarding the amount of mortar that should be mixed at a time, or in its other form, the maximum time the mortar can stand before putting into briquets without affecting the accuracy or uniformity of the tests.

Time of Setting is covered by (32)

apparatus and manipulation of test; (33) definition of beginning of set; (34) of end of set; (35) should neat cement or mortar of stated proportions be used; (36) consistency; (37) temperature of materials and air, quantity of water and method of mixing; (38) method of making pats or filling molds; (39) treatment of pats or briquets during setting; (40) temperature of water where pats are placed. Some of these questions overlap a little.

Soundness is very properly left to the individual answering the question for discussion, since the practice is so varied and the theory is in so indefinite a state. A description of the recommended method of testing, in detail, with modifications in everyday practice, is asked for both Portland and natural cements in 41.

The questions regarding tests for strength will be given next month.

The list of questions thus far has slightly the air of an attempt to reduce the number asked to a minimum. It would seem to be better to run the risk of asking a few needless questions than to cut the number down too much. The knowledge of cement in general is so meager that what seems to be a useless question to one may be considered quite important to another. Probably no one to whom the circular is sent can answer all the questions from his own experience. Would it not have been well to caution all to answer only those questions of fact in which each has had actual experience, and to state the reason for opinions expressed in reply to questions calling for opinions. The reasons are much more valuable than the bare opinions, but few are likely to give them unless they are called for specifically. However, the writer is not on the committee, and certainly would need more information and discussion than any member. Only the results of the deliberations of the committee are likely to be published, so that engineers generally will not have an opportunity to examine the individual replies.

Proposed Commission of Public Health. A bill has been introduced in the National House of Representatives proposing to establish a commission of public health, under the supervision of a commissioner of public health. The bill is said to have been drafted by the American Medical Association and approved by the American Public Health Association. The abstract of the bill which is sent to the press contains sections which quietly transfer the state quarantine services, almost without the use of the word quarantine, to the proposed commission, remove the Marine Hospital service from its present efficient hands and make it a bureau of the proposed commission, and give the commission power only limited by the amount of appropriations to make investigations, promulgate rules which on approval of the president shall have the effect of law, establish and enforce quaran-

tines against foreign nations and between states or districts; in short, gives the commission almost unlimited powers, which may readily be extended in fields not apparently touched by the bill. The commissioner is the responsible head of the department, the arbiter of the destinies of the citizens. He has an advisory council, selected from designated sources and consisting of fifty or more members, with no more authority or responsibility than a meeting of the American Public Health Association, so unwieldy, and from the mode of appointment so perfunctory in its acts that its sphere of usefulness is very limited. Care is taken to word the bill in such manner that it is probable that not less than forty or fifty members, and probably forty-nine, shall be physicians, and the commissioner and his assistant must belong to the same profession.

This statement, and still more a reading of the abstract of the bill sent out by the American Public Health Association, show that it is proposed to create a very large and expensive bureau independent of any other department of the government, and place it, with the practically unlimited powers conferred upon it, in the hands of a single man; and that the instrument creating it is loosely drawn, not well considered in plan or in details, is not co-ordinated with other departments, will duplicate work already in progress, and destroy other work of value. A revision and extension of our National Board of Heath and quarantine laws and of statistical and experimental work is very greatly to be desired, but it is not probable that congress will accept this bill as a proper solution of the problem, if the members examine it attentively.

A Point in the Design of Flush-Tanks. The question of the effect of the discharge of flush-tanks upon the sewers and the distance at which the flushing stream has any appreciable effect is one on which but few data have been secured. The references given in the question department this month are all that the writer has been able to discover. It is possible, with a full knowledge of all the facts, to determine by computation with reasonable accuracy the effective velocity and volume at any point in the sewer. One very important item is the amount and rate of discharge of the flush-tank. When the tank is of such design that the rate of discharge varies with the depth of water in the tank, the average rate, determined from the known volume and time of discharge, will vary materially from the maximum rate of discharge. In such cases the principal part of the flushing effect is produced by the earlier part of the discharge and the latter part of the discharge may have little or no effect. This is true, especially if the gradient of the sewer is steep. The distance to which the discharge through a practically clean pipe acts as a water piston, filling the pipe full,

varies materially, therefore, with the design of the tank, as to rate of discharge. It depends to a less extent upon the amount of discharge if the gradient is uniform or increasing. When there is a decrease in gradient the water behind has some opportunity to catch up and the flushing effect is felt farther. As illustrating the relative effects of rate of discharge, capacity and gradient, the following figures are given, derived from Mr. Rosewater's experiments:

	8-inch Sewers.																	10-inch Sewers.		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(1)	(2)	(3)
Capacity of tank gallons																					
Velocity due to average rate of discharge in feet a second	223	334	319	20	303	262	161	329	225	318	206	191	312	186	404	493	390	475	319	400	188
Observed velocity to first manhole in feet a second	2.6	3.9	4.0	3.6	3.7	4.5	6.1	5.0	2.9	4.1	5.2	6.0	8.1	3.6	1.1	3.8	5.3	1.5	2.2	2.2	2.5
Gradient per cent.	8.6	8.6	10.2	8.6	7.3	4.9	8.1	8.2	5.4	6.5	6.9	5.4	4.6	1.9	2.4	3.1	4.6	5.6	7.3	6.4	1.1
	8.7	6.0	5.3	4.2	3.1	3.1	2.5	2.2	1.7	1.7	1.4	1.4	0.9	0.9	0.1	0.4	0.4	0.4	4.1	2.2	0.8

The acceleration in velocity on gradients greater than 1.4 per cent. from the average velocity of discharge is marked in the 8-inch pipes. There is such an acceleration in all the 10-inch pipes observed. The effect of this acceleration would be to diminish the depth of the flushing stream farther down the sewer. This will be shown on some diagrams in preparation (based on the same experiments) where the effect is not marked by reductions in per cent. of fall or by increase in size of sewer. The point it is desired to make here is that in the selection of a tank, especially as to rate and amount of discharge, the size and gradient of the sewer to be flushed should be taken into account. A tank which would be perfectly satisfactory on a sewer of low percentage of fall might be quite the reverse at the head of a steep hill.

Methods of Filtration of Water.

The chief engineer of the water-works of Moscow, Russia, Mr. Nicholas P. Simin, has examined a number of plants in the United States during a recent visit and has presented his conclusions regarding methods of water filtration. Some of these are very interesting. He states his opinion as the results of his investigation that gravity filters possess indisputable superiority in comparison with direct-pressure filters; that a coagulant must be used in a direct-pressure filter; the rate of filtration must be constant, and that a settling basin into which the

water flows after the coagulant is added, is very desirable, as it can relieve the filter of much of the heavy work which it would otherwise be compelled to do. He has observed that with proper control the direct-pressure filters give very satisfactory results. The same control is equally indispensable for slow sand filters.

He suggests some alterations of practice in mechanical filters which he thinks would decrease the cost of the work and increase the efficiency. One of these suggestions is a removable agitator, one of which would answer for a whole battery of filters. This could be used if his next suggestion is adopted, namely, to agitate and wash only the top 1 to 5 inches, applying the wash water at the top of the filter. Such a method of washing would postpone the washing of the entire bed for some time, and could be done more cheaply than at present. He considers the method of cleaning by machinery much preferable to the hand methods of the slow sand filter. It is also cheaper, and the ease with which it can be done and the small proportion of the plant which is disabled at any one time by the process are points very favorable to the mechanical filter. The larger area necessary for slow sand filtration, the greater difficulty of testing the work of all parts of the plant and the greater amount of hand labor required are points against that method. The frequent necessity of covering filter beds adds largely to the cost of slow sand filtration owing to the large areas to be covered.

A paper by Charles E. Fowler, superintendent and engineer of public works at Poughkeepsie, before the New England Water-works Association, details many of the difficulties to be met with in the climate of the northern states and with a river carrying a comparatively small amount of sediment. The facts in the paper conform with those on which Mr. Simin based his opinions. These beds are not covered, but the frequent trouble in cleaning, on account of the clogging effect of some rapidly-growing algæ, shows the great desirability of putting the filter in the dark, the algæ complained of growing only in the light. The formation of thick ice on the surface of the water on the beds, or the freezing of the beds themselves for a considerable depth, seriously affects the action of the filter in winter, and greatly hinders and sometimes prevents, for a considerable period of time, the proper cleaning of the surface layer of sand. This also indicates the necessity for a covering and such additional protection as may be necessary to prevent freezing. The difference in efficiency of the filters when the works are well taken care of and when they are only slightly neglected, is also demonstrated, there being a change in the number of bacteria removed by the filtration from 98 per cent. to 85 per cent., and in aggravated cases of inability to

clean the beds on account of cold, to 31 per cent. Although the population of Poughkeepsie has increased very slightly in the last fifteen years, it was necessary last year to add a bed 260 feet long and 114 feet wide to the old double bed 200 feet long and 150 feet wide, with its settling basin 60 feet long, 25 feet wide and 12 feet deep. The total area devoted to filtration is now 1.36 acres for a population of 23,000. The normal rate of filtration for the old bed was formerly 4,500,000 gallons in 24 hours, but is now 5,000,000 gallons, the consumption ranging from 1,500,000 to 2,000,000 gallons a day, and the pumps running only part of the time. This is filtration at the rate of 6,500,000 to 7,500,000 gallons per acre per day. With the new bed added, the filtration rate can be reduced to about 3,500,000 gallons a day with the same program of pumping. The cost of the original filter bed was about $62,000, and of the new bed exclusive of land was about $29,000, or at the rate of $90,000 an acre for the old bed, and at the rate of $67,000 an acre for the entire filter bed. The average cost of operation and maintenance of the filter beds for the last twenty years has been $2.99 a million gallons.

A mechanical filter plant has just been installed at Kingston, another Hudson river town of about the same size as Poughkeepsie. The capacity of this plant is about 4,000,000 gallons in twenty-four hours, but the water it treats is from a mountain stream and is not Hudson river water, so that an exact comparison can not be made of cost of operation. The cost of the filter plant has not yet been published. It consists of eight filters with the necessary pipes and a building 63 feet by 70.

Mr. Simin's conclusions regarding the two methods of filtration agree substantially with what seems to be the common opinion at this time, namely, that the slow sand filtration is the most efficient, but that for the same money in plant and in operation a better result can be obtained with a mechanical plant. Some of his suggestions regarding modifications in practice are worthy of careful experimentation.

CURRENT INFORMATION.

Agreement of Portland Cement Trade of Great Britain.

The cement trade section of the London Chamber of Commerce, which has been carrying on investigations for the last three years of cement admixtures, has adopted the following resolutions:

After full consideration the section recently adopted the following resolution: That Portland cement be defined as a mixture of two or more suitable materials intimately and artificially mixed in the requisite proportions, and afterward properly calcined and ground, to which nothing has been added during or after calcination, excepting that an addition not exceeding 2 per cent. of gypsum is permissible for the purpose of regulating the setting. That the following rule be adopted: That if any material whatever excepting 2 per cent. of gypsum for the purpose of regulating the setting be added to the Portland cement clinker during or after calcination, the article so produced shall not be sold as

Portland cement, but under some other distinctive name.

That the members of the cement trade section of the London Chamber of Commerce, together with all manufacturers of Portland cement in Great Britain and Ireland who are not members of that association, be invited to sign the following declaration of conformity to the above rule in respect of all Portland cement made by them wherever manufactured: We, the undersigned, hereby agree to conform to and carry out the rule of the cement trade section of the London Chamber of Commerce as set forth in a report made by the section and adopted at a meeting held on Monday, the 10th of May, 1897: "That if any material whatever, excepting an amount not exceeding 2 per cent. of gypsum for the purpose of regulating the setting, be added to the Portland cement clinker during or after calcination the article so produced shall not be sold as Portland cement, but under some other distinctive name." And we further agree that if at any time any of the parties to this agreement shall by resolution of a majority of those present at a meeting of such parties duly and properly convened in accordance with the practice of the London Chamber of Commerce, such resolution having been duly and properly confirmed by a majority of those present at a subsequent meeting called at not less than fourteen days' notice, be found to have failed to conform to and carry out the said rule, then in such case his or their name or names shall be struck off the list and notice of the same made public in such manner as shall be resolved.

The resolution was based upon the evidence of various experts, which is summed up in the conclusions of Stranger and Blount, as follows:

"Ragstone is a natural form of calcium carbonate mixed with siliceous matter. It is an inert substance incapable of setting when gauged with water. Ragstone when mixed with Portland cement undergoes no chemical change, and does not combine with cement either in the dry state or when the mixture is gauged with water. Mixtures of ragstone and cement have a specific gravity lower than that of unmixed cement, and, indeed, correspond closely in specific gravity with that calculated from the respective specific gravities of the two materials. The specific gravity of normal ragstone may be taken as 2.70, and that of normal cement as 3.15, so that the difference between them is substantial. Save for minor effects caused by the slight slaking action of moisture commonly present in ordinary ragstone, the part played by ragstone mixed with cement is purely mechanical. The product obtained from the two materials is merely a mechanical mixture, and is in no sense a chemical combination. In our opinion such a mixture cannot correctly be termed Portland cement. Gypsum added to cement for the purpose of regulating the setting time in quantities not exceeding 2 per cent. of the weight of the cement has no deleterious influence on the quality of the cement."

Stranger and Blount say, with reference to other materials, that they are unable to give a general opinion as to their influence on cement when mixed with it, and that they would have to report separately as to each after long and careful investigation. In conclusion they express the opinion that whatever be the effects, whether good or bad, of the admixture of any material whatever with Portland cement clinker after calcination, the article so produced cannot be termed Portland cement. This view is indorsed by each of the other experts and the section approves it. The chamber reproduces a part of a paper read by Messrs. Stranger and Blount at a meeting of the Society of Chemical Industry Nov. 1, 1897, in which they say:

Ragstone is not a cementitious substance, and its addition to cement is an adulteration. Perfectly sound cement is weakened by the addition of ragstone. This weakening is not fully proportional to the percentage of ragstone added, because the latter acts as a fine filling material and fills up the interstices naturally present in set cement. Cement which is not perfectly sound may be temporarily improved by the addition of ragstone. When the cement has become sound by aeration this improvement disappears. Many minor points were examined in the course of the main investigation, but the most important results are embodied in the conclusions given above.

Additions to Cement Other Than Ragstone.—One of these which particularly came within our purview in the course of our investigation for the London Chamber of Commerce is gypsum. Gypsum is largely used in Germany, and to a considerable extent in this country, in quantities not exceeding 2 per cent., and usually smaller than this, in order to lengthen the setting time of the cement. Regarding cement as a chemically-finished product in the state in which it comes from the kilns, needing nothing but mechanical comminution to make it saleable, the addition of any substance to the finished clinker must be considered in strictness an adulterant. Nevertheless, it is added for a distinct and useful purpose, and in quantities smaller than 2 per cent. does not affect the cement injuriously, so far as our experiments indicate. The last and worst adulterant with which it is our purpose to deal is blast-furnace slag. As far as our experience goes, this most objectionable addition to Portland cement is not employed on the Thames and Medway, but in certain other districts it is used in large quantities for the preparation of a grossly sophisticated product which is fraudulently sold as Portland cement.

We must not be understood as condemning true slag cement made by mixing granulated blast furnace slag with slaked lime and sold under its proper title. This material is a perfectly legitimate product, and has its own uses; no one can reasonably object to its utilization if it is not covertly substituted for Portland cement. But the addition of blast furnace slag to Portland cement is another matter altogether. The general practice of the manufacturers who seek to increase their profits by the use of slag appears to be to add to the clinker, as it goes to the crushers, as much crude blast furnace slag as they consider can be mixed with Portland cement without risk of detection by the ordinary consumer, who buys cement

in quantities so small that the cost of its analysis is too great for him to pay. The quantity added may be as much as 30 or 40 per cent., and detection is not easy, or even always possible, for an unskilled observer. Apart from the fraudulent character of this addition, about which no doubt can well be entertained, there arises the question of its effect on cement. All materials added to Portland cement after the clinker comes from the kilns are adulterants, with the exception of gypsum, which is a recognized addition for a specific purpose in quantities not exceeding 2 per cent. Of the two adulterants which have been specially dealt with, viz., ragstone and blast furnace slag, the latter is by far the more objectionable, and it should be condemned and rejected by makers and users alike. In this view we believe we are supported by the great majority of engineers and manufacturers.

The circular is signed, on behalf of the cement trade section of the chamber of commerce, by Charles Charleton, chairman of the section; Leedman White, chairman of special admixtures; Wm. Porter, publication committee; Kenric B. Murray, secretary London chamber of commerce. It has also been signed by a large number of cement firms.

On page 45 of the January, 1898, issue of Municipal Engineering, will be found an article briefly describing some of the investigations made by Stranger and Blount and Dr. Michaelis.

Cost of Macadam Roads in Massachusetts.

In compliance with an order of the common council, Winslow L. Webber, city engineer, and F. R. Wheeler, superintendent of highways of Gloucester, Mass., have made estimates of the cost of macadamizing Eastern avenue, Prospect and Washington streets, Essex avenue, East Main street and Maplewood avenue. They state that the cost of state highway construction under the contract system during the last three years has ranged from $6,000 to $24,547 per mile and has averaged $10,033, divided as follows:

For grading and excavating	$ 1,241
For gravel	520
For Telford and drains	367
For macadam and shaping	5,694
For masonry	448
For guard rail	188
For paved gutters	191
For engineering, superintendence and inspection	679
For minor construction, drainage, catch basins, culverts, etc	431
For stone bounds	54
For advertising	18
For weighing stone	24
For sundries	178
Total	$10,033

They state that the elements of the cost of a macadam road are so numerous and variable that it is always a local question which depends upon the cost of labor, superintendence, transportation, tools, machinery, character of stone, drainage of roadbed, etc. The estimates which they submit are based on the contract system. If the work is done by day labor under the direction of the highway department 25 per cent. should be added. These estimates are as follows: Eastern avenue, $10,000; Prospect street, $5,500; Washington street, $63,250; Essex avenue, $47,250; East Main street, $6,500; Maplewood avenue, $4,900; Western avenue, $1,400; Main street, $3,400; total, $142,200. This estimate is for a total of about fourteen miles of macadam.

Indictment of Brooklyn City Officials.

Indictments were returned by the grand jury, in the Kings County Criminal Court in Brooklyn, March 25, against former city officials of Brooklyn. The indictments, it is alleged, are the outcome of an investigation of the public works department. The officials are charged with a conspiracy by which the city was defrauded of $80,000 by means of fraudulent contracts. The records charge the $80,000 to "emergency work." The law required that all work, the cost of which was to exceed $2,000, should be awarded by contract after advertisement for the regular time. The records show that most of these small pieces of work and the money for them went into the hands of a firm that appeared on the books as Thomas Frazier & Co., but really Daniel Doody, a contractor. These bills for "emergency work" had to receive the "O. K." of Water Purveyor Knapp, be certified by Deputy City Works Commissioner Palmer and were finally paid by City Treasurer Taylor. The indictments, of which there are nine, are against the following officials: Former City Works Commissioner Theodore B. Willis and Police Commissioner W. E. Phillips, indicted jointly; Robert W. Fielding, former deputy city works commissioner, indicted on three counts; Oscar Knapp, former water purveyor, indicted on three counts; Fred Milne, inspector, indicted on three counts; former Alderman William J. Leacraft; former Alderman Clarke; A. L. Jenson, a clerk in Controller Palmer's office; an official in former Auditor Sutton's office, name not known. Theodore B. Willis states that he is innocent of any wrong-doing and that his arrest was a rank injustice.

Limitation of the Contracting Power of Indiana Towns.

Judge Gillette decided in favor of the plaintiff in the water works suit, at Fowler, Ind., of James M. Richey vs. the town of Fowler et al. to restrain it from levying or assessing a tax for the payment of funding

bonds, to the amount of $9,000, provided for by an ordinance adopted August 27, 1897. The decision perpetually restrains the defendants from collecting or enforcing the payment of said claims, or demands; from transferring or attempting to transfer any money from the general fund of the town to specific or particular funds for the payment of water rent under contract for the purchase of the plant from the water company and defendant officers. They are further restrained from paying water rentals. The Fowler Water Company is perpetually restrained from alleging or asserting any claim of any kind whatsoever against the town of Fowler. The case involves the question of the power of the town to in any manner enter into an obligation that practically seeks to evade the constitutional limit of indebtedness to 2 per cent. of the taxable property of the municipality. The case is one of importance to contractors and others who deal with Indiana municipalities. It will be appealed to the supreme court.

Asphalt Company's Suit Against the Secretary of Interior.

An answer was filed March 8, by William Van Deventer, solicitor for the department of the interior, to the suit brought in the Supreme Court of the District of Columbia, by the American Asphalt Company of Colorado, against Cornelius N. Bliss, secretary of the interior of the United States, and William A. Jones, commissioner of Indian affairs. The suit pertains to the lease of certain asphalt lands occupied by the Unitah and White River Indian tribes.

Required Methods of Awarding Contracts in Kansas City.

Judge Slover, in division 2 of the Circuit Court, Kansas City, Mo., handed down an opinion March 19 in a suit against the Parker-Washington Paving company and the mayor and common council of Kansas City. The decision was adverse to the company. This suit was brought by George Eberle and is identical with nine other suits, so that the decision is regarded as having the effect of leaving no impediment to the city proceeding with public improvements. The action of the plaintiff, as owner of property in Kansas City, was to enjoin the city from approving a contract let by the city engineer to the Parker-Washington company to pave a part of Tracey-ave. The authority to let contracts of the kind in question is contained in section 993 of the general ordinances of Kansas City, and is as follows:

"Bids shall be opened on the day fixed, between 12 m. and 1 o'clock p. m., and the lowest and best bidder shall be accepted by the city engineer, and said committee, or the member or members thereof then present; provided, however, that the city engineer, or other person acting, may reject any and all bids if deemed too high, or the parties bidding are considered irresponsible."

Under this ordinance the power to accept the bid and let the contract is confided to the city engineer and one or more members of the committee of the common council, but the power to reject a bid is given to the city engineer or a member of the committee. In other words, to bind the city the co-operation of the city engineer and the committee of the common council, or some member of the committee, is required; but to reject a bid requires only the action of one of the parties named. "This seems to be the construction placed upon this section by the common council itself," says the court, "for it has a committee of its members to act in conjunction with the city engineer in accepting bids for public works and letting contracts therefor, and if the council has no voice in the letting of contracts for public works, it may as well dispense with its committee authorized to act with the city engineer in matters of that kind. It has been suggested that the plaintiff has misconceived his remedy. It is, as contended by the defendant Parker-Washington company, a well settled rule that courts will not interfere by injunction with the exercise of the legislative power vested by law in municipal bodies, but this rule must not be confounded with another equally well settled rule, that where a municipal body is not acting within the limits of the power conferred upon it, but is guilty of a plain departure from such powers, injunction is a proper remedy. As the city engineer had no power to accept the bids and let the contract in question without the consent of the committee or some one member of it, his act is without authority in law and the temporary injunction, as prayed for, will be granted."

The plaintiff, Eberle, and the nine other plaintiffs, had satisfied themselves before going into court, that the defeat of the Parker-Washington company would not endanger any tax bills which they themselves might hold. In instituting the suits their effort was to prove that the city engineer could not legally let a contract without the consent of a majority of the public improvements committee, but so it was apprehended, if this contention were proven, then it would not be unlikely that the court, in declaring the method illegal, might decide that debts incurred under it were also illegal. Under the decision, however, of Verdin vs. St. Louis,

31 Mo., and in the 56th Mo. Appeal, Forey vs. Ridge, it was held that while property-owners might stop an evil and evade going into debt under tax bills, if they remained passive and allowed a debt to be incurred, they must then pay the bills as they had in a way condoned the irregularity. In making the decision the court practically said that for over ten years the city authorities have been working in an improper way with regard to the letting of public contracts, but, although their ways were improper and contracts were illegally let, it is established in law that tax bills incurred under those contracts are all of them valid.

Instruction in Municipal Questions at Chicago.

It is reported that L. E. McGann, commissioner of public works, Chicago, Ill., contemplates the organization of a school of instruction. His plan is said to require bureau heads and chief clerks to prepare and read to each other papers on the duties of their respective positions. The topics to be discussed are to include the following:

The surfacing of macadam streets with sheet asphalt.

The laying of vitrified brick to prevent the decay of asphalt.

The daily collection of garbage.

The adoption of the grooved rail and a consequent solidity in the street where the tracks are put.

Improvements in the laying of asphalt pavements.

The flushing system of cleaning granite block streets.

Improved methods of inspection of street material.

Contract system of street cleaning, with fines for neglect.

The keeping open for traffic streets and pavements on which buildings are in the course of erection by a system of bridging.

The regulation of projecting street signs.

The cleaning of snow and gutters by abutting property-owners.

The hauling of snow from street railway tracks at the expense of the companies.

The establishment of a municipal livery stable, shoeing and repair shop.

Water Supply of Columbus, O.

The report of Prof. Edward Orton, Jr., on the water supply of Columbus, O., was considered and adopted by the board of trade March 8. Prof. Orton said that the judgment of the water works committee on the present situation is expressed in the following statement:

1. That the best interests of the city demand that it shall retain the ownership and full control of its water supply.

2. The plan now proposed by the city authorities for storing water seems to be in the right line, and to have been worked out with due care and thoroughness

3. That the water of the Scioto cannot be a permanently safe and satisfactory supply until it has been subjected to the modern process of intermittent filtration.

4. That adequate plans for such filtration shall be connected with the increase of the supply, even though they are not put into immediate execution.

5. That our authorities owe it to themselves and the people of the city to secure the approval of their plans by recognized sanitary authority and by the state board of health before entering on work of such magnitude.

6. That the board of trade will heartily approve these plans.

Sale of Asphaltum and Gilsonite Lands in Utah.

A bill was introduced March 10 by Senator Rawlins to provide for the disposal of the asphaltum lands within the Uncompahgre Indian reservation in Utah. The bill, which was referred to the committee on Indian affairs, provides that the secretary of the interior, as soon as may be after the passage of the act, shall cause public surveys to be made of all lands known to contain asphaltum or gilsonite in the Uncompahgre Indian reservation in Utah into claims one thousand five hundred feet along the course, apex, or outcrop of the vein of such mineral, and three hundred feet on each side of the center thereof; also cause such claims to be so marked on the ground that the same can be readily located and identified and described by numbers.

The register and receiver of the land office at Salt Lake City is requested to advertise the lands to be sold, and the bids are to be submitted to him, accompanied by a certified check at the rate of $5 an acre. The land will be sold to the highest bidder, but at not less than $10 an acre. Only citizens of the United States may become purchasers. Other conditions are that a prepayment of $5 an acre be made; that within one year after the land is struck off to him the purchaser shall expend at least $100 for the development thereof; that during each succeeding year the further sum of $100 shall be expended, until the full sum of $500 has been so expended, and after the expiration of not less than three nor more than five years from the date of original purchase satisfactory proof be made to the land department of compliance with the foregoing conditions, and that such purchase is for the exclusive use of the purchaser; and upon payment of the balance of the purchase price for said land a patent shall be issued therefor. The secretary of the interior may make such rules as he may deem necessary to carry into effect the foregoing provisions.

Alleged Corruption in Philadelphia Council.

Sensational allegations of bribery and corruption are being made in the common council of Philadelphia, Pa. The trouble grows out of an ordinance offered in the common council which provided for a transfer of the water works to the Schuylkill Valley company for a period of fifty years, the city to pay the company $1,400,000 a year for its water supply. Nelson G. Green of New York, representing the company, is accused of an illegal attempt to obtain a favorable report from the water committee by the payment of between $15,000 and $25,000. During a consideration of the bill in common council, March 10, Walter W. Stevenson, a member of that body, stated that he had been offered $5,000 by a member of the city committee to vote for the bill. The chairman of the finance committee of councils, Jacob J. Seeds, demanded an investigation of the charges and offered to furnish supplementary evidence as to their truth. A councilmanic investigating committee was appointed to make a thorough investigation of the charges. District Attorney Graham promptly took up the case, and on March 23, a hearing was given before Judges Gordon and Bregy of the common pleas court, on the charges against Peter E. Smith, the member of the city committee who offered Councilman Stevenson $5,000. Committeeman Smith was held in $10,000 bail. This hearing resulted in Councilman L. J. Walker declaring that he and Councilman Edwin E. Smith had each accepted $500 from Councilman Seger to vote for the bill in committee, and averring that Councilman J. Emery Byram had previously offered him $5,000 to vote for the bill in the chamber, but he had refused the money and voted against it. The self-accused councilman, L. J. Walker, is said to have made a clean breast of the whole affair in District Attorney Graham's office after the hearing, but was permitted to go after promising to appear when wanted.

Slippage of Water Pumps.

The board of arbitrators appointed to investigate the controversy between Kansas City, Mo., and the Metropolitan Water company of Kansas City, Kas., has decided in favor of the city. The history of the controversy is that when the United States court turned the plant over to the city it ordered that all water furnished to the Metropolitan Water company should be metered at Kaw Point. The officials of the water department at that time failed to do this, but a compromise was agreed on whereby an allowance of 1,700,000 gallons per twenty-four hours was made for slippage. This arrangement proved unsatisfactory and resulted in a prolonged controversy. The water department officials claimed pay for more water than the Metropolitan water officials would give credit for, but the Metropolitan company continued to pay about $2,000 per month, the water department accepting it on account. Wynkoop Kiersted, chief engineer of the water department, was finally instructed by the board of public works to get into communication with Lee Riley, chief engineer of the Metropolitan Water company, with a view of ascertaining if they could get together on some basis of settlement. In case they failed to agree they were empowered by both the Kansas City water department and the Metropolitan company officials to call in a third man, each agreeing to abide by the decision of a majority of the three men. David M. Greene of Troy, N. Y., an authority on hydraulic engineering and an expert on pump slippage, was selected as an arbitrator. The experts made three tests and the slippage of the pumps was found to be as follows: First method, 2,872.28 gallons per minute; second method, 3,090 gallons per minute; third method, 2,926.46 gallons per minute, making an average of the three methods of 2,962.9. This average was adopted as the slippage of the Kaw Point pump at the time of making the tests. The final result as to grand totals, using this average, shows the delivery to the Metropolitan Water company through the pumps at Kaw Point from December 1, 1895, to March 1, 1898, 1,957,939,200 gallons. This, together with the water delivered through the Fowler meter of 233,906,444 gallons, makes a total of 2,251,854,644 gallons, which, at $30 per million, the price set by the court, would amount to $67,555.37. The water company has paid in that time $58,754.67, leaving it in debt to the Kansas City water department up to March 1, 1898, $8,850.70.

Proposed Improvement Society in Connecticut.

As a means of promoting the general improvement of the highways, sewerage and drainage systems of the State of Connecticut, James H. McDonald, highway commissioner, will send a circular to the mayors of cities, selectmen of towns, wardens of boroughs, boards of public works, street commissioners and all other public officials interested in improving the highways, sewerage and drainage systems, inviting them to a preliminary meeting to be held in the capitol for the purpose of organizing the "Con-

necticut Improvement Society." The idea embodied in the plan is not a new one with Mr. McDonald, as he first tried to arouse some interest in it about two years ago, but those to whom it was explained at that time were unappreciative and nothing resulted from it. The date for the meeting has not been decided upon.

Contractors Object to Paving Specifications in Toledo.

The paving contractors of Toledo, O., have agreed to test, in court, the new street paving specifications, which were recently prepared and submitted to council by City Engineer Brown. Contractors say they are a radical change from anything the city has ever had, and the particular point on which they will be attacked is the advertisement calling for bids. Contractors claim that the advertisement is not specific enough; that it does not state the requirements of the specifications; that in other matters the advertisement is insufficient to make a legal contract in the bidding, although the contractors refuse to state what these matters are. Another point opposed by the contractors is holding 10 per cent. of the contract price as a guarantee that the pavement will last for five years, and at the same time give bond for the construction of the pavement. Certain kinds of material are designated which the contractors are bound to use in the work. One is a grouting for brick pavements, whis is manufactured by but one firm in the country, and the contractors claim for all of them to be obliged to purchase of one man creates a monopoly for him. One contractor, in speaking on this point, said: "If we are obliged to use a certain kind of grout in the paving, the city has no right to hold back a portion of our money as a guarantee that the pavement will last the required length of time. Every man has his own kind of grouting, and if he is obliged to use another kind, he does not feel like giving a guarantee on something that he knows nothing about. This is one of the reasons why the contractors are opposed to the new specifications, and either want them changed, or the advertisement changed to conform with them."

Inequitable Taxation for Water Works.

In his annual report Joel Foster, superintendent of the water works at Montpelier, Vt., makes plain the injustice of requiring private water consumers to pay for water used for public purposes, such as fire extinguishing, street sprinkling, supply of public buildings, etc., instead of raising the money to pay for water used in this way by a general tax. By computation he shows that the wealthiest property-owners pay much less for fire protection than their less wealthy neighbors. Previous to 1897 $2,300 yearly was raised by general taxation toward the expenses of the water department. In 1897, however, no appropriation was made, the total expense for the water works being met from individual water rates. This resulted in payments corresponding to 0.036 per cent. on their assessments by persons having property assessed at $10,000 or more, and 0.092 per cent. for all below, thus requiring a man worth $4,000 to pay, in the average, about the same amount toward the public service as a man worth $10,000.

Kerosene in Newark Water.

A new employe of the Standard Oil company at Newark, N. J., recently opened the wrong valve and allowed a quantity of oil, equal to ten or twelve barrels, to flow into the Pequannock river instead of back into one of the tanks, as he was instructed to do. The oil affected the water supply, especially in the southern and western sections of the city, leaving a distinct and unpleasant taste of kerosene in the water. Morris R. Sherrerd, superintendent, was of the opinion, however, that most of the oil-polluted water went over the dam and that only a small portion of it got through the intake. To prevent a recurrence of the trouble the East Jersey Water company was notified, and action will doubtless be taken soon.

Test of Paving Brick in Detroit.

A test of paving brick is favored by D. W. H. Moreland, president of the board of public works at Detroit, Mich., along the lines proposed by Alderman Thompson. The rattler will be filled with enough brick of the kind to be tested, to occupy 15 per cent. of its volume and giving it 1,000 revolutions at thirty revolutions per minute. The board of public works is to notify the brick men of the test and invite them to submit samples in lots of not less than 2,500 brick to be delivered at the western yard free of charge, except the freight, which will be paid by the city. The test will begin early in April.

Prize Contest for Civil Engineers.

The Royal Administration of the Swedish State Railways invites civil engineers or other interested parties to enter a competition of designs for the arrangement of new railroad stations, junctions, etc., etc., for the city of Stockholm. The first prize is to be 12,000 Swedish crowns (about $3,230), the second, 8,000 Swedish crowns (about $2,150)

and the third 4,000 Swedish crowns (about $1,075). The time for competition will expire at noon on the 31st of August, 1898. Particulars concerning the nature of the work will be furnished by the Swedish-Norwegian legation, 2011 Q street, Washington, D. C., or by the vice-consul of Sweden and Norway, Mr. August Peterson, LeDroit building, corner F and Eighth streets, Washington, D. C. Security to the amount of $13.50 for the use of drawings in this competition is required, but this will be refunded when the drawings are returned.

The Future of Passaic River.

C. C. Vermeule, topographer and consulting engineer of the New Jersey State Geological Survey, is of the opinion that if the East Jersey Water company is allowed to draw water from the Passaic river at Little Falls, and no trunk sewer is built to carry off the sewage of the cities along the river, all of this region from the upper end of Paterson to Newark bay will be uninhabitable in ten years. The river from Paterson down would, in that time, be a great open sewer, and little or no fresh water will flow into it. The bed above Dundee dam would be exposed, and from the dam down only tidal water will be in the channel, and that does not carry off sewage. The sewage of Paterson and Passaic would come down in a stream not attenuated in any appreciable degree by water, and would choke up the channel with filth and disease germs, generating pestilence which would undoubtedly be followed by a plague. The flow of the river at Little Falls in the summer is, at the lowest, 85,000,000 gallons a day. Works are being constructed by the water company, which will draw from this, during the first year, 52,000,000 gallons, which would leave only 33,000,000 gallons at the season of the lowest flow. The population along the Passaic is increasing at the rate of 40 per cent. every ten years, and the consumption of water 50 per cent., so that at this rate of increase the water company will be drawing, in ten years, about 80,000,000 gallons. Alphonse Fteley, engineer of the aqueduct commission of New York, agrees with Mr. Vermeule as to the bad condition of the river, and while he will make no prediction as to what may occur in ten years or any other time, he says there is no question that if the water company takes this water from the river the polluted condition will be greatly aggravated. As has been stated before in Municipal Engineering, Mr. Fteley advises the construction of a trunk sewer to conduct the crude sewage to the sea, and to not permit it to enter the river at any point. The Passaic Valley Mutual Protective Association, Passaic, N. J., has warned the East Jersey Water company to desist from its expenditure of further money in the construction of a pumping station and intake and laying pipes at Little Falls. The association claims that the work is being prosecuted preparatory to diverting and appropriating the water of Passaic river to its private use, for commercial purposes, thereby diminishing the flow of the river and to acquire permanent control of the supply, and by the exercise of such control to make it impossible for the population of that section of the State, which must take its public water supply from the Passaic river or its tributaries to obtain such supply otherwise than by the purchase from the company. In a resolution passed by the association March 4 it says the proposed diversion of water is a usurpation of the public rights in the Passaic river and its tributaries, and a violation of the rights of the riparian owners of the association and of other riparian owners on the Passaic river below the intake at Little Falls.

Municipal Reports.

Annual Report of the City Engineer of Holyoke, Mass., for the Year Ending Nov. 30, 1897. By John J. Kirkpatrick, City Engineer.

Much of the time of Mr. Kirkpatrick during the last year has been devoted to supplying deficiencies in the official records of his office, and he has put matters in shape for better preservation of data of this kind for the future. The first brick pavement in Holyoke was laid last year. Part of it was laid on a foundation of four inches of concrete and part on a foundation of gravel eight inches deep, rolled by a twelve-ton roller. This was for the purpose of testing the two kinds of foundation, as it is an open question whether or not the winter frosts, which usually penetrate to a depth of three feet in that latitude, will disturb the surface where gravel foundation is used. Mr. Kirkpatrick says he is convinced that brick is the most suitable pavement for Holyoke. He strongly urges that the city shall at once pave all of the heavy-traffic streets, and issue bonds for the purpose, instead of doing a little work each year.

First Annual Report of the City of St. Albans, Vt., for the Year Ending Jan. 31, 1898.

Mr. J. H. Stubbs, superintendent of water works and streets, says that St. Albans, like many other growing towns, finds itself encumbered with much of so-called improvements constructed at large expense no longer adequate to serve its needs. He thinks

it would be true economy to construct without delay a suitable sewerage system. He advises a complete survey of the town and the preparation of maps showing all natural and artificial features. He favors the paving of the streets with telford, and estimates that twenty miles of roadway in St. Albans can be paved with this material at a cost of $120,000.

Annual Report of the City Engineer of the City of Mankato, Minn., for the Year 1897, by J. R. Thompson, City Engineer.

Mr. Thompson reports that two pieces of the cement sewer pipe laid in Mankato eight years ago were recently taken up and were found to be perfectly sound and the interior as smooth as new pipe. The water department of Mankato shows a profit of $1,273.70, without charges for 117 hydrants and for street sprinkling, which, if added at a fair rate, would make a total profit of $6,868.70.

Official Reports of the Officers of the City of South Norwalk, Conn., for the Year 1897.

The report of the water commissioners show a balance for the year of $2,340.10 and a surplus account of $98,320.19, represented by extensions and improvements. The receipts for the year amounted to $22,745.50. The street commissioners are well pleased with the telford paving done during the year. They recommend an extra appropriation of $5,000 a year for permanent paving, which, with what can be saved from the regular appropriations for streets, will enable them to pave the principal streets in a few years. They indicate a preference for brick.

New Publications.

Sanitary Engineering, by William Paul Gerhard, New York. Published by the Author. Pp. 132.

Mr. Gerhard has written and talked a good deal in the last few years about the study and practice of sanitary engineering, and has helped to emphasize the importance of better attention to sanitary conditions. This little volume consists largely of his lectures and articles heretofore published, in which he treats the relation of sanitary engineering to architecture, municipal government, etc. He correctly states that the sanitary engineer should possess a general knowledge of civil engineering, of architecture and of sanitary science; the civil engineer and architect should, on the other hand, possess rather thorough knowledge of sanitary principles. Mr. Gerhard's book indicates much in this direction. It is especially interesting to those who have charge of municipal work. In discussing the actual practice of the sanitary engineer he treats briefly of the water supply of cities, sewerage, prevention of pollution of water courses, sewage disposal, street pavements, street cleaning, removal of snow and ice, street sprinkling, cleansing of footways and sidewalks, removal of refuse, sanitation of towns, etc.

De Pontibus. A Pocket-book for Bridge Engineers, by J. A. L. Waddell, C. E. Published by John Wiley & Sons, New York.

Mr. Waddell's success in bridge engineering will deservedly command the attention of others interested in the same kind of work for a book giving the best results of his experience. The whimsical title given the volume, because it affords the author the only opportunity he has ever found to show that he knows something about Latin, is a bit of innocent pedantry, which may affect the book commercially, but is not a characteristic of the style of its contents, for it is clearly and tersely written in good, plain English. The author indulges the whim for the sake of his little joke with evident determination to be amused if others regard it seriously. The book is a mine of useful and practical knowledge, much of it originating from the author's experience, and it will be invaluable to all who are interested in bridge construction. The text is supplemented with many tables and diagrams.

High Masonry Dams. By E. Sherman Gould, Consulting Engineer for Water Works. Published by D. Van Nostrand & Co., New York.

This is an up-to-date substitute for the volume bearing the same title by John B. McMaster in the Van Nostrand Science Series. It will be further considered at another time.

Technical Meetings.

The Engineers' club of Minneapolis, at its annual meeting Feb. 4, elected officers for 1898 as follows: President, F. W. Cappelen; vice-president, I. E. Howe; secretary and treasurer, H. E. Smith; librarian, W. W. Redfield; member of the board of managers of the Association of Engineering societies, George D. Shepardson.

The New England Water Works association held a meeting March 9 in Boston. Charles E. Fowler, superintendent of water works at Poughkeepsie, N. Y., presented a paper on "Slow Sand Filtration at Poughkeepsie, N. Y."

At a regular meeting of the Mining and Metallurgical section of the Franklin institute at Philadelphia, March 9, Robert W. Lesley read a paper on "The Development of the American Portland Cement Industry."

The annual dinner of the Boston Society

of Civil Engineers was held March 8. Hon. Josiah Quincy, mayor of Boston, in a speech said that good or bad city government was largely a matter of good or bad engineering. He dwelt at some length on the need of technical advisers on the part of municipalities, and told how engineers had been employed by the city of Boston to investigate the methods of garbage disposal. Addresses were made by the following persons: Alphonse Fteley, president Am. Soc. C. E.; James M. Crafts, president Massachusetts Institute of Technology; Lucius Tuttle, president Boston & Maine R. R.; Henry Sprague, chairman Metropolitan Water Commissioners; John C. Trautwine, Jr. Assoc. M. Am. Soc. C. E., secretary of Association of Engineering Societies and chief of the bureau of water of Philadelphia; Henry Sherman of the Massachusetts Civil Service Commission; Woodward Emery, chairman of the Board of Harbor and Land Commissioners, and Lieut. J. S. Sewell, U. S. Engineer Corps.

The American Wated Works association will hold its annual convention in Buffalo, N. Y., beginning June 14. Col. Francis G. Ward, superintendent of the Buffalo Water Bureau, is on the executive committee.

Personal.

W. W. Southgate has been appointed city engineer at Nashville, Tenn.

Alonzo H. Kimball has been appointed street commissioner at Medford, Mass.

J. C. Shepard has been re-elected superintendent of the water works at Fullerton, Cal.

M. F. Walsh has been elected chairman of the board of public works at Holyoke, Mass.

William H. Brooks has been appointed chief of the bureau of highways, to succeed Thomas L. Hicks, at Philadelphia, Pa.

Horace Loomis, M. Am. Soc. C. E., who has served for a number of years as engineer in charge of sewers in the department of public works, New York City, has been appointed chief engineer of the department of sewers for the borough of Manhattan, New York City.

J. A. Brodie, M. I. C. E., Liverpool, England, has been appointed city engineer to succeed H. Percy Boulnois, who has joined the engineering staff of the local government board.

Henry Rodgers has been re-elected city engineer at Anderson, Ind.

George A. Carpenter has been re-elected city engineer at Pawtucket, R. I.

Clarence Hubbard has been elected commissioner of highways at Bath, N. Y.

John Graham has been elected park commissioner at Everett, Mass.

Frank Rau has been elected superintendent of public works and J. J. McKnight city surveyor at Rockville, Conn.

J. H. Hunter has been appointed superintendent of parks at Paterson, N. J.

F. C. Manchester, Winchester, Mass., has been appointed a member of the Metropolitan park commission by Governor Wolcott.

W. H. Wetzel, Bellefonte, Pa., has been appointed county surveyor of Center county.

T. Howard Barnes has been appointed city engineer and Charles H. Parker, commissioner of sewers, at Medford, Mass.

John D. Muders has resigned his position as president of the board of water commissioners, at Newport, Ky.

Bertram Brewer has been appointed city engineer and Richard A. Jones, superintendent of streets, at Waltham, Mass.

William W. Locke, Assoc. M. Am. Soc. C. E., has accepted the position of sanitary inspector on the Sudbury and Cochituate water sheds of the Metropolitan Water Board, Boston, Mass. His address will be 49 Conard-st., South Framingham, Mass.

Daniel Neff has been appointed road commissioner, at Reading, Pa.

Harrison R. Waterhouse has been elected street commissioner at Gorham, Me.

S. T. Addison, John Burrows, George Eldridge and G. F. Jones have been elected and Leopold Strouse and Col. G. E. Boynton have been appointed members of the new water board, at Baltimore, Md.

Capt. D. F. A. Wheelock, Assoc. Mem. Am. Soc. C. E., has been unanimously re-elected city engineer, at Warren, Pa.

Robert Gwynne, Jr., has been re-elected mayor, at Salem, N. J.

Cooper B. Hatch has been elected mayor at Camden, N. J.

Jacob Bauer has been elected village commissioner, at Hackensack, N. J.

Charles S. Eggleston, H. Howell and Chas. W. McBride have been elected water commissioners at Fairport, N. Y.

Harry S. Haines has been appointed borough engineer and Abel Hillman superintendent of streets at Haddonfield, N. J.

Thomas James has been appointed commissioner of water works to succeed John Muders, resigned, at Newport, Ky.

J. Ashton Williams has been appointed superintendent of water works and Richard Moldoon superintendent of streets at Vergennes, Vt.

Edward H. Keating, M. Am. Soc. E., ex-city engineer of Toronto, Ont., has been presented with a silver platter by the employes of the city engineering department as a mark of appreciation of his kindnesses during his term of office. Mr. Keating is now general manager of the Toronto Street Railway company.

F. K. Duke has been elected a member of the board of aldermen and John Aken, R. J. Cresswell and J. P. Henry members of the council at Cape May, N. J. James Ritchie was elected mayor and George W. Stapleton and Charles R. Windhovel members of the council at South Cape May. S. E. Ewing was elected mayor and Charles Schillinger, William Cummings, D. C. Eldridge, David Oliver, John D. Craig and David Hughes members of the council at West Cape May.

Capt. Charles P. Lord has been re-elected mayor at Vineland, N. J. Frank W. Flood was elected a member of the council.

John F. Wahl has been elected chosen freeholder at New Providence, R. I., and John Nevins and Robert Clark were elected surveyors of the highways.

George S. Turner has been elected surveyor of highways at Swedesboro, Pa.; Chas. S. Dilks and J. S. Kincaid at Mantau, Pa., and Geo. Wilkinson and Edward Gaunt at Harrisonville, Pa.

F. C. Kelsey has been nominated as city engineer, to succeed himself, at Salt Lake City, Utah.

Thomas D. Pearce has been elected a member of the Park Commission, to succeed the late William M. Singerly, at Philadelphia, Pa.

Silas W. Washburn, Chauncey S. Horton and Jacob S. Dressner have been elected members of the board of water commissioners at Peekskill, N. Y.

Alexander Potter, Assoc. M. Am. Soc. C. E., New York City, has been engaged to superintend the construction of the sewerage system at Newport News, Va.

Charles Stickney, Charles Leutzow, Adam Currie, W. C. Picker and E. D. Hoyt have been appointed members of the water works commission at Wauwatosa, Wis.

James Meathe has been appointed a member of the board of water commissioners at Detroit, Mich.

Lawrence F. Lewis, C. E., has been elected city commissioner, to succeed Wm. A. Hanway, and Frederick R. Bye, commissioner of street cleaning, at Baltimore, Md.

Francis E. Wright and E. S. Cheatham have been appointed extra and assisting engineers on the sewer extension work at Memphis, Tenn., with M. P. Cooper and A. S. Watson as assistants. Mr. Wright was until recently connected with the United States government works.

John De Wolf of Brooklyn has been appointed landscape architect by the park board of New York City.

Edward P. North, M. Am. Soc. C. E., has resigned the position of consulting engineer to the department of public works, New York City.

John Franklin has been appointed city engineer and superintendent of public works to succeed C. E. Gore, at Hudson, N. Y.

Louis F. Garrard, Jr., has been elected secretary and treasurer of the Columbus Water Works company, Columbus, Ga., to succeed J. G. Beasley, who retires April 1. H. H. Epping, Sr., was re-elected president of the company.

Jacob D. Wund has been appointed superintendent of street paving and repairing in the department of highways, New York City.

William H. Shannon has been re-elected president of the board of water commissioners at Newburgh, N. Y. James F. Templeton, Charles A. Dixon, Joseph A. Smed and George M. Ross, members of the water board, have been re-elected.

Frank A. Tyson has been re-elected president of the water board, James Hangen clerk and E. L. Lindewurth secretary at Reading, Pa.

W. D. Stratton has been elected president, E. S. Merrill clerk, T. W. Davey superintendent and Pat Scully assistant superintendent of the board of water commissioners at Middletown, N. Y.

William D. Luey has been elected sewer commissioners, at Athol, Mass.

J. A. Burleigh has been elected water commissioners at Waterbury, Vt.

James Whitlock has been elected street commissioner at Louisiana, Mo.

Geo. M. Newton has been elected city engineer and A. B. Underwood street commissioner at Dunkirk, N. Y.

S. M. Eachns has been appointed street commissioner at West Chester, Pa.

Michael Moriarity has been elected superintendent of the streets of Putnam, Conn.

William Gray has been elected highway commissioner at Milton, N. Y.

Thomas B. Moseley has been re-elected superintendent of streets at Westfield, Mass.

T. W. Davey has been appointed superintendent of water works at Middletown, N. Y.

Frederick Hancock has been appointed assistant city commissioner at Baltimore, Md.

John T. Caine has been appointed superintendent of water works at Salt Lake City, Utah.

William L. Kenly has been elected chief engineer of the water board at Baltimore, Md.

Capt. George C. Norton has been elected a member of the board of directors of the water company at Louisville, Ky., to succeed W. T. Rolph.

Andrew J. Graham has been reappointed a member of the West Park board for seven years at Chicago, Ill.

Robert Van Buren has been appointed chief engineer of the water supply for the borough of Brooklyn, N. Y.

MACHINERY AND TRADE.

Recent Inventions.

(Reported specially for MUNICIPAL ENGINEERING, by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for 10 cents.)

599,340.—Feb. 22, 1898.—Device For Loading Dirt, Gravel, etc., Onto Wagons.—T. E. Lawrence and A. R. Cooper, Mooresville, Ind. In this device an inclined track, up which a scraper may be hauled, is pivoted at its upper end upon the side of the wagon. The pivotal connection is a double one, so that the track may be swung around a vertical and a horizontal axis.

599,760.—March 1, 1898.—Excavating Apparatus.—J. W. Adams, Augusta, Ga.

599,936.—March 1, 1898.—Street Sweeper.—J. Jones & A. Gilleo, Toronto, Canada. The usual obliquely set brush operated by gearing connected with the driving axle with means for throwing the gears out of mesh.

599,937.—March 1, 1898.—Street Scraper.—To same parties as 599,936. In combination with the usual obliquely set brush is an auxiliary brush the shaft of which is connected to the shaft of the main brush by a universal joint. The auxiliary brush operates outside the track of the trucks and may be set at any desired angle to the main brush.

599,938.—March 1, 1898.—Street Sprinkler.—To same parties as 599,936.

599,971.—March 1, 1898.—Water Filter.—H. Millstine, Pittsburg, Pa. A crib is created in a water supply and the bottom is extend-

ed down to bed rock. A series of openings are then provided at a point where water filtered through the alluvial deposits may flow in. Above these openings is a false bottom with a trap door and an outlet main leading out from above the false bottom.

600,393. March 1, 1899.—Dumping Wagon.—Thomas Wright.—Jersey City, N. J.—Leaf springs are secured, at their forward ends, to the main bars of the wagon, and at their rear ends are provided with projections which engage trackways carried by the movable body.

600,071.—March 1, 1898.—Dumping Wagon. C. M. Haeske, South Bend, Ind.

600,222.—March 8, 1898.—Street Sweeper. John Hasson, Reading Pa. A combined sprinkler and sweeper.

600,855.—March 22, 1898.—Garbage Burning Furnace.—J. F. G. De Bonardi, Versailles, and A. D. F. De Villeysigne, Paris, France. The garbage is first distilled, the distillate being carried away at a relatively low temperature and so as to shield the fresh garbage from the air, and the residuum burned, the heat developed being used to heat the fresh garbage.

601,106.—March 22, 1898.—W. H. Scott, St. Louis, Mo. The scraper blades are detachably secured to an endless ditching chain, the said chain being mounted so as to be swung at any desired angle.

Trade Notes.

The F. C. Austin Manufacturing company, whose works at Carpenter and Carroll-aves., were burned several weeks ago, will, according to press reports, establish its new plant at Harvey, Ill.

The White Haven Brick company, New Brunswick, N. J., has been incorporated to manufacture and deal in pressed and paving brick, by W. J. Burke and E. H. Ludeman, of Brooklyn, N. Y., and J. A. Green of Perth Amboy, N. J.

The Douglas & Whistler Brick company, Rochester, Pa., has been incorporated to erect a plant at Vanport, to manufacture building and paving brick. The officers of the company are: President, Dr. W. C. Simpson, New Brighton; vice-president, James B. Douglas, Rochester; secretary, Abelard Whisler; treasurer and superintendent, James Douglas, sr.

A. L. Gilbert of New York, and representing New York and western capitalists, has secured options on shale and clay lands at Hudson, N. Y. A company will be formed to manufacture vitrified and other brick.

The Emery Brick company, Harriman, Tenn., will, according to press reports, enlarge its scope by the manufacture of paving brick.

The stockholders of the South Zanesville Sewer Pipe and Brick Works, Zanesville, O., has chosen for directors J. C. Bolen, James Herdman, S. F. Edgar, J. C. Holliday and W. S. O'Neal. The directors elected officers as follows: President, S. F. Edgar; treasurer, James Herdman; manager, J. C. Bolen.

The Saugerites Paving Brick Co., New York City, has been incorporated. John F. Harris, Jr., Catskill, is general manager.

The Standard Silica Cement Co., Glens Falls, N. Y., elected officers and directors at its annual meeting as follows: President, S. G. Williams; vice-president, D. E. Moran; secretary and treasurer, W. B. Newcomer; Directors: Wm. E. Spier, Byron Lapham, T. S. Coolidge and W. W. Maclay of Glens Falls, and S. G. Williams, D. E. Moran and W. B. Newcomer of New York.

The purchase of a stone crusher is contemplated at South Hadley Falls, Mass.

The common council at Willimantic, Conn., has been authorized to appropriate $4,500 for the purchase of a steam road roller and material for macadamizing.

The highway committee, Gloucester, Mass., has asked for an appropriation of $2,500 for purchasing a new stone crusher and for repairing the old one.

The street committee, Roanoke, Va., has recommended the purchase of a stone crusher at a cost of about $1,425.

The common council at Middletown, Conn., voted, March 14, to purchase a steam road roller at a cost of about $4,000.

Bids are wanted at Ottawa, Ont., until April 9 for supply and delivery of 120,000 barrels of Portland cement. L. K. Jones, secretary department railways and canals.

Hetherington & Berner of Indianapolis have just finished a new railway asphalt plant for the Warrern-Scharf Asphalt company. It has been tested during the last few days and is now ready for use.

The California Asphaltum company of Ventura, Cal., whose works have been closed down during the last winter, has resumed operations.

Marl, suitable for the manufacture of Portland cement, is said to be found in unlimited quantities at the bottom of Lake Marl, at White Pigeon, Mich.

A plant for the manufacture of Portland cement will soon be established in the vicinity of Cobb lake by Jackson, Mich., capitalists. The company's office will be located in Hillsdale, Mich.

The Maryland Cement company, which was organized last year at Baltimore for the manufacture of Portland cement out of clay, has begun business at Sapprows Point.

The establishment of a plant for the manufacture of cement at Bellaire, O., is contemplated by Charles R. Gostling of Baltimore and Ira Momrey of New York.

A plant for the manufacture of cement tile is being located at Hastings, Minn., by Rupert Peterson and August Anderson of Minneapolis.

The Dunn Manufacturing company of Pittsburg, Pa., has established a branch office at room 128, Illinois Bank building, 115 Dearborn street, Chicago, Ill., for the sale and handling of their patent extensible trench braces.

The Ideal Tool company of Indianapolis has issued a new illustrated folder showing the various tools made by them for use in cement work of every description and especially in cement sidewalk construction. They call special attention to their "jointer," "bevel," "gutter" and "imprint roller" tools. They state that all their tools are made with great accuracy of composition bell metal and brass. Every cement worker should know

about them. A folder may be had for the asking.

The O. S. Kelly company has sold a steam road roller to the city of Green Bay, Wis.

A little typographical error sometimes makes a large difference in meaning, as, for instance, that newspaper item about the railroad locomotive that ran over a cow and cut her into halves, which was made very sensational by the compositor's blunder in substituting a c for the h in "halves." A typographical error in the last number of this magazine, while quite different, was almost equally extreme. The error was in the article on "California Asphalt" in the Machinery and Trade Department, where, referring to the Western Oil & Asphalt company, a sentence reads: "This institution, instead of being a paying concern, as are so many asphalt companies, confines itself to the extraction and marketing of asphalts, selling to all contractors alike without preference." It is the little y that makes an annoying difference in this item. The word which apepars as "paying" should have been "paving."

Henry Mayer & Co. of Erie, Pa., have issued a circular describing Mayer's new vertical gravity sand heater. Some of the advantages claimed for this heater are that it has no shafts to break, no gearing to wear out, requires no power to operate it, is reasonable as to first cost and requires practically no expense to maintain it. The heaters are made in six sizes, with capacities running from 10 to 100 tons of hot sand in ten hours, on a basis of thirty-five tons of sand to one ton of coal or one cord of wood.

The Commercial Wood and Cement company of New York has lately issued several pamphlets giving information regarding the different brands of cement for which they are general sales agents. The pamphlets contain many illustrations and much information regarding the merits of and proper methods of using cement. In one of the pamphlets is an article of much value on American Portland cement by W. W. Maclay, C. E. Copies of these pamphlets may be obtained by addressing the Commercial Wood and Cement company, No. 156 Fifth-ave., New York.

SELECTIONS FROM THE PRESS.

Water Main Cleaning.

BY W. MURDOCK, C. E.

There are three leading mains supplying the city of St. John, N. B. Number one, 12 inches in diameter, was laid in the year 1851; number two was laid in 1857, and has a diameter of 24 inches; number three also twenty-four inches in diameter, was laid in the year 1873. The reservoir from which the city's supply is derived is an artificial lake on Little river, distant five miles from the summit of the city and 160 feet above the level of high water in the harbor. The summit of the city is 130 feet above h. w. datum, and the hydraulic gradient in summer time generally reaches this district at an elevation of about 145 feet, the fall being thus about 15 feet, and the head of water 15 feet. In winter this head of 15 feet has been known to disappear during lengthy periods of zero weather when water was being wasted to prevent freezing.

The two older mains had become so foul through internal incrustation that, when No. 3 was shut off for repairs and the city depended on the other two pipes, all the portions at a hight of 80 feet or more above datum, comprising an area of about 200 acres and containing a population of about 8,500 souls, were without water. On the other hand, with No. 2 shut off and supply coming by Nos. 1 and 3, every pipe was full and water delivered at a level of 130 feet. This was an ample demonstration of the foulness of the old mains as compared with that last laid. In the summer of 1897 the common council passed an order directing that the mains be cleaned, and preparations were forthwith begun.

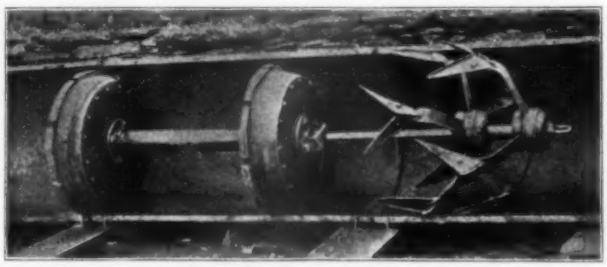
There being no hatch boxes on the main lines, such fittings had to be designed and tenders asked for their manufacture. James Fleming being the lowest bidder, he was awarded the contract at two cents per pounds. Delivery began in the month of October, and the work of cleaning No. 2 was started soon after. In designing the cleaner or mechanical scraper, special precautions were taken to avoid the misfortune of having it lodge in the pipe with such consequent vexations, searchings and cuttings of pipe as have often occurred elsewhere. The desiderata laid down were:

(1.) That the apparatus be as light as possible, so as to be easily projected up ascending gradients by the pressure of the water, and to offer generally as little resistance as possible whether through inertia or otherwise.

(2). That as it is more desirable to take light cuts and make frequent runs, than attempt to remove all the dirt at once and have the scraper stick; therefore, the pistons should be so loose as to permit a free escape of water to carry off the loosened dirt in advance of the cleaner, and that the arms be not so rigid as to hold it up against any hard and abrupt obstruction encountered.

With these maxims in view, the machine was made as shown in the accompanying cuts, the pistons being of birch set in layers, each layer being one inch in thickness and placed crosswise of the other to prevent warping and increase the strength of the piston. Leathers were secured to the pis-

ton by means of an iron ring bolted against them, the bolts running through the piston. The spindle connecting the two pistons is of 3-inch wrought-iron pipe with a cast-iron flange screwed on each end and pinned over with a hammer to prevent the screw backing out. These flanges are each bolted through the piston to another flange on the opposite side. Projecting beyond the forward piston is an iron rod fitted with two sets of radical arms sloping back as shown in the cuts There are four arms in each set made of No. 10 (B. W. G.) spring steel two inches wide, and each fitted with a forged steel scraper on the end, of the form shown in the drawings. The long sloping fish-tail form of this scraper enabled it to glide safely over every obstruction. In making the first runs, only one set of scrapers was attached; but in the latter, the whole eight were in use. This precaution was taken for the reason given, viz., lest a large amount of dirt should be loosened at once, and the cleaner become buried and stop.



Mechanical Scraper, Used in Cleaning St. John, N. B., Water Mains.

A section of No. 2 main extending from the reservoir toward the city, a distance of about 6,000 feet, having been prepared by inserting a hatch-box at each end, the work of cleaning began on October 12 at 1 p. m., and was continued that afternoon. The head of water upon the upper hatch-box was 20 feet and on the lower 27 feet. The first run took four hours, for the reason that a cord sufficiently long to reach the whole length had been placed on a revolving drum 10 feet in circumference, and furnished with an indicator to register the revolutions. The end of this string was attached to the cleaner, and a record kept of its location as it sped along. But when the first flushing branch was reached the twine drifted out here and down the brook, while the drum kept on revolving and the indicator registering until the whole string was paid out. Meanwhile the cleaner had become securely moored near the flushing branch and could not be liberated until the stop-cock was dug to and uncovered. On the twine being cut and pulled out and the stop-cock lid restored, water was let on again and the cleaner finished its journey, a distance of 2,200 feet in about five minutes. This first run was sufficient to show that twine was dangerous, and we also learned that it was entirely unnecessary, for the grating sound of the cleaner as it passed through the pipe was heard quite distinctly by the two watchers under their feet as they followed the sound along the line. Two more runs were given that same afternoon, the time occupied to go the distance being about twenty minutes. The water was inky black for some time as it flowed from the flushing pipe, and it was allowed to run for two hours after the cleaner had been removed, this time having been required for the water to clarify.

The next section was taken on Saturday, Oct. 23. It extended about 6,600 feet city-ward, but in order to give the first section another scraping it was concluded to insert the cleaner at the dam and run it through the entire 2.4 miles. A misfortune was met this time in the following manner: The leathers having worn out during the first cleaning were renewed with a harder and stiffer quality than formerly, but they repeatedly caught in a new joint made while inserting the hatch box. Each time the lid was removed to ascertain why the cleaner did not start, it was found firmly fixed by this imperfect butt of the two pipe ends. After twice extricating it and again finding it caught in the same way, a jack screw was applied to push it past this obstruction, the lid again was put on and the water let in at 4:05 p.m., and this time it started. At each of the five flushing stations the gate was left open fully ten minutes after the cleaner had passed, and then closed. As soon as the gate was closed the cleaner again proceeded, and the scraper, with only one piston, reached the end of its run at 5:25 p. m., having been one hour and twenty minutes going two miles,

but when fifty minutes of a total stoppage are reckoned, the machine was found to have been in motion thirty minutes. As stated, only the forward part of the cleaner arrived, and search had to be made for the remainder. Nothing was done on the following day, which was Sunday, the castaway piston, which was lying obliquely somewhere in the pipe, having but partially obstructed the flow, and the water was left on until the Monday night following.

A receiving chamber unites Nos. 2 and 3 mains near No. 3 hatch box, and they are controlled by stop-cocks on each side of the receiver. It was, therefore, an easy matter to reverse the current of water in No. 3 by closing the stop-cock at the dam, and opening that at the receiver, as well as the flushing branches. This was done, and men were distributed along the line to listen for a rumbling noise, which at length was heard within about a quarter mile of hatch box No. 3, from which the cleaner had been extracted. The sound was followed along the line toward the reservoir until hatch box No. 2 was reached, when the derelict was taken out, after having traveled nearly a mile and crossed a valley about 90 feet in depth. It was found that the pressure of the packscrew in forcing the cleaner past the uneven joint had cracked one of the flanges, with the result that after having traveled about 2¼ miles the cleaner fell apart. The forward part, comprising a piston and the scraper, pushed on, but the spindle attached to the rear piston fell to the bottom of the pipe, ploughed up some dirt and finally became embedded and jammed. The reverse current striking the piston as it did, drove it back with the spindle trailing behind. The apparatus was repaired and three more runs made through this double section of 12,600 feet, on October 29th, without any further mishap, the time taken for each run, including ten minutes stoppage at each of the five flushing stations, having been from 1 hour 46 minutes to 1 hour and 55 minutes. The cold weather being on when the next castings arrived, cleaning operations were suspended for the season, to be resumed next spring.

On testing the efficiency of the cleaned main by shutting off No. 3 from the reservoir to the receiving chamber, where both unite, and bringing the supply through Nos. 1 and 2, it was found that the pressure in the city was as good as when No. 2 was shut, and the whole supply coming through Nos. 1 and 3, thereby showing that the capacity of No. 2 had improved to such an extent that whereas, with No. 1 it had formerly delivered to a hight of 80 feet only, when unassisted by No. 3, and left 200 acres of the city, containing 8,500 inhabitants, without water, now the whole city could be supplied without the help of No. 3 and the water rise to a hight of 130 feet above high water. The general improvement in pressure with all three mains on was found to be about four feet. Nearly two miles of this line remain yet to be cleaned, after which the other two pipes will be taken as soon as the coming season permits.—Canadian Engineer.

St. Paul Voted Solidly Against It.

The president of the League of American Municipalities conplains to the mayor of St. Paul that the St. Paul council has made a serious error in voting solidly against a resolution allowing the city to join the league.

The St. Paul council is a level-headed assembly that is not likely to be inveigled into a scheme to contribute public funds to assist any individual enterprise and the League of American Municipalities must be so considered by all intelligent men.

The league solicits membership from various cities, asking a fee of $50 for admission.

In event it should be successful in persuading a majority of American cities to accept membership at such a princely sum it would have a treasury like the newly discovered gold mines off the coast of southeastern Alaska. It would seem that a fee of $5 instead of $50 would be a sufficient amount for all purposes necessary to carry out the work which the league proposes, and it is not apparent what the exhorbitant amount is intended for. * * * It seems incredible that any body of politicians should favor it.—The American Land and Title Register, St. Paul.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

East St. Louis, Ill.—James Speer, M. Fehner, Fred Eberhardt, W. H. Hill and N. R. Anderson visited Indianapolis and Terre Haute, Ind., March 10 and 11 to inspect brick pavements.

Washington, D. C. — The senate committee on appropriations has added considerably to the house appropriations in the district appropriation bill, and the item added for paving is one of the largest. The house appropriation was $125,000, and the senate committee has increased it to $150,000, for paving roadways under the permit system, with the provision that the pavement shall abut upon and connect with some existing pavement, and that the work so done shall be completed to the entire width of the roadway and shall be at least one square in length. The appropriation for improving streets, according to schedules, has been increased from $100,000 to $200,000. The Georgetown schedule has been increased from $9,000 to $18,000; the northwest section schedule from $29,000 to $58,000; the southwest section schedule from $14,000 to $28,000, the southeast section schedule from $22,000 to $44,000 and the northeast section schedule from $26,000 to $52,000, the amount being double in each instance.

Grand Rapids, Mich.—The board of public works adopted a new form of specifications, March 18, for improving streets with gravel, brick, cedar blocks and asphalt. The most important change from the old specifica-

tions is in regard to the guarantee on asphalt pavement, as it now takes into consideration and more clearly expresses what is meant by "good condition at the end of five years."

New York City.—The board of public improvements adopted a resolution, March 16, approving the amendment to the charter, which provides for uniformity in the cost of improvement. Under the charter the taxpayers of Brooklyn are assessed for a proportion of the cost of repaving, while in Manhattan and the Bronx the expense is borne by the city. President Grout of Brooklyn drafted the bill to make all the boroughs equal in that regard. The bill is now in the hands of the cities' committee of the senate.

Ft. Wayne, Ind.—Representatives of the Barber Asphalt Paving company and the Bermudez Asphalt Paving company and other companies, notified the board of public works, March 18, that they could not pave all of Calhoun-st., from curb to curb, with sheet asphalt, as it would not stand the constant jar which would be produced by coming in contact with the street railroad tracks. It is proposed that one row of asphalt blocks be laid next to the rails on each side, and pave the portion of the street between the track and from the rails to the curb with sheet asphalt.

Ottumwa, Ia.—The city council unanimously decided, March 2, to do no more street paving until the present law in the new code, which prohibits cities from requiring contractors to guarantee their paving for more than one year, is either repealed or modified. The new law provides that "all contracts for the making or reconstruction of street improvements or sewers shall contain a provision obliging the contractor and his bondsmen to keep such improvement or sewer in good repair for not exceeding one year after acceptance of the same by the city, and the bond shall be so conditioned."

Des Moines, Ia.—An injunction restraining the city from assessing the cost of the West Grand-ave. paving until the whole contract has been completed, has been asked by Walter McCain. This same question was raised in regard to paving Sixth-ave., and it was then held by the city authorities that they could assess by sections if the city saw fit. The matter was not taken to court, however. The whole street is included in a single contract, and the question is whether or not the property before which the pavement is laid can be assessed for the cost of the improvement until the whole street included in the contract is paved.

Irvington, Ind.—Bids were received, March 28, for paving Washington-st., and were referred to the committee on streets, alleys and contracts and the town engineer, to be reported on March 31. The bids were submitted in two sections of the street, and were payow wafo and as follows: From Wallace to Central-ave.—Geo. W. McCray—Clinton block, $4.07; John Moore—Clinton block, $3.56, macadam, $2.50; Porter & Hadley—Clinton block, $3.74; Indiana Bermudez Asphalt Co.—Bermudez asphalt, $4.43; Daniel Foley—Clinton standard block, $3.75; Indiana paving block, $3.75; Wabash Clay Co.'s standard block, $3.88; macadam, $2.45; C. A. Kenyon—Indiana paving block, $3.79; Poston block, $3.87; Poston block, seconds, $3.59; Clinton standard block, $3.79; Western Paving & Supply Co.—Asphalt with Parkhurst combined curb and gutter, $4.63; Capital Paving & Construction Co.—Indiana paving brick, $4.14; Canton paving brick, $4.20; Wabash Clay Co.'s brick, $4.24; Clinton paving brick, $4.20. From Central-ave. to Line-st.—Capital Paving & Construction Co.—Indiana paving brick, $4.04; Canton paving brick, $4.09; Wabash Clay Co.'s brick, $4.15; Clinton paving brick, $4.15; Western Paving Supply Co.—Asphalt, $4.87; Hoosier Construction Co.—Indiana paving block, $3.87; Poston block, $3.96; Poston block, seconds, $3.59; Clinton standard block, $3.87; Daniel Foley—Clinton standard block, $3.95; Indiana paving block, $3.95; Wabash Clay Co.'s standard block, $4.07; using stratified curb 10 cts. more; macadam using any kind of [illegible] $2.50; Indiana Bermudez Asphalt Co.—Bermudez asphalt, combined curb and gutter, $4.65; Geo. W. McCray & Co.—Indiana brick or Clinton block, Parkhurst curb, $4.77; macadam, stratified curb, $2.49; John Moore—Brick, $3.25; macadam, $2.28.

CONTEMPLATED WORK.

Milton, Pa.—Brick paving is contemplated. W. C. Miller, cy. clk.

Cortland, N. Y.—Main-st. will be paved this year. Asphalt is favored.

Anaconda, Mont.—The council has been petitioned to pave five streets.

Carthage, Ind.—The town council has voted to construct cement sidewalks.

Bridgeport, W. Va.—The question of issuing bonds for brick paving will be voted on.

Cumberland, Md.—Front-st. will be paved with brick. Chas. E. Widener, cy. engr.

Binghamton, N. Y.—Asphalt or brick paving is proposed for Court-st., from Exchange-st. east.

Milwaukee, Wis.—Brick paving is proposed for Grand-ave., from Fourth to Eighth-st.

Baltimore, Md.—Ordinances have been introduced for macadamizing a number of streets.

Hudson, N. Y.—About one mile of macadam road will be constructed. John Franklin, cy. engr.

York, Pa.—The construction of vitrified brick paving is contemplated for this summer. G. G. Durbin, cy. engr.

Rome, N. Y.—The question of constructing asphalt and brick paving is being considered. F. A. Coleman, cy. engr.

Wheeling, W. Va.—This city contemplates the construction of 12,000 sq. yds. of brick paving soon. A. L. White, cy. engr.

Topeka, Kas.—About 15 miles of 6-ft. vitrified brick sidewalks will be laid. W. H. Barnes, cy. engr.

Camden, N. J.—An ordinance for paving five of the principal streets with asphalt has been signed by Mayor Hatch.

Deering, Me.—About 8,000 sq. yds. of granite block or macadam paving is contemplated. I. W. Barbour, cy. engr.

Elyria, O.—A petition has been presented to council for brick in two streets. W. H. Park, cy. clk.

Groton, Conn.—An appropriation of $3,000 has been voted to build a macadam road. Wm. P. Allis, secy. bd. of trade.

Plainville, Conn.—At a town meeting held March 21, an appropriation of $1,600 was voted to macadamize a portion of W. Main-st.

Shamokin, Pa.—The construction of about 20,000 sq. yds. of brick paving is contemplated. C. H. Doty, cy. engr.

Rochester, N. Y.—Asphalt paving is proposed for the entire length of Glenwood-ave.; estimated cost, $40,000.

Fairbury, Ill.—N. Main-st. will be paved with brick for a distance of three-quarters of a mile. W. A. Doane, cy. engr.

Exeter Center, R. I.—The taxpayers of this village are circulating a petition that the main street be macadamized.

New Britain, Conn.—The construction of asphalt, brick and macadam paving is contemplated. Geo. C. Dunkan, cy. engr.

Rock Island, Ill.—About eleven blocks of brick paving will be constructed. A. D. Thusing, cy. clk.

Springfield, Ill.—About three miles of brick paving will be constructed. Frank H. Hamilton, cy. engr.

Carthage, Ill.—(Special.)—J. M. Springer, cy. clk., says: "We are not likely to build any hard roads this year."

McKee's Rock, Pa.—The borough council contemplates paving Island-ave. to the borough limits.

Quincy, Ill.—The city council has adopted ordinances for about three miles of street paving.

Muskegon, Mich.—The question of issuing $25,000 highway bonds will be voted on April 4.

Bridgeport, O.—The council has passed a resolution to repair and improve the streets and pave with brick; estimated cost, $60,000.

Jackson, Miss.—The question of issuing $8,500 bonds, the city's share for paving Main-st. with brick, will be voted on April 4.

Hicksville, N. Y.—The county board of supervisors contemplates macadamizing the principal streets of this village.

Fond du Lac, Wis.—The construction of about 18,000 sq. yds. of macadam paving is contemplated. E. B. Parsons, cy. engr.

Omaha, Neb.—A bill has been introduced in the House providing for macadamizing a road from South Omaha to Fort Crook, Neb.

Cleveland, O.—Brick paving is contemplated for Lake-ave., from the Lake Shore R. R. tracks to Detroit-st.

Chicago, Ill.—An ordinance is proposed for paving with asphalt W. Madison-st., between Western-ave. and Fortieth-st.

Milwaukee, Wis.—Curbing and guttering is contemplated for a large number of streets in the outlying wards.

North Pelham, N. Y.—This village has voted to bond for $30,000 for street and sidewalk improvements.

Marshalltown, Ia.—Paving has been petitioned for N. Center-st., from State to First-st. Mayor Pierce.

Pittsburg, Pa.—Ordinances were passed in common council, March 14, for paving and curbing a number of streets.

Atlanta, Ga.—The council has recommended that Edgewood-ave. be improved at a cost of $2,000.

Bar Harbor, Me.—Main-st., from Cottage to West, will be macadamized and sidewalks constructed.

Reading, Pa.—The city council has appropriated $100,000 for paving certain streets with sheet asphalt and vitrified brick.

Norristown, Pa.—The construction of about thirty blocks of vitrified brick paving is contemplated for this year. M. D. Patterson, cy. engr.

Sandusky, O.—An ordinance was passed March 9 for 1,945 sq. yds. of brick and 16,795 sq. yds. of asphalt paving on Wayne-st.

Port Clinton, O.—A petition will be presented to council asking that Third-st., from Washington to Depot, be paved with brick.

Southington, Conn.—The construction of about 3,000 ft. of telford road is contemplated. F. H. McKenzie, cy. engr.

Revere, Mass.—A committee of seven will be appointed to consider the best plans for permanently improving the highways.

Leicester, Mass.—The selectmen have been asked for an appropriation for constructing a road from W. Park-st. to W. Center-st.

Cambridge, Mass.—An order has been adopted by the boad of aldermen creating a city loan of $50,000 for the construction of streets.

Mahanoy City, Pa.—About twenty-two blocks of brick paving is contemplated this spring at a cost of about $50,000. D. P. Kutz, chrmn. com

Manchester, N. H.—An appropriation of $23,000 for the repair of the highways and $4,000 for paving North and South Main-sts. has been voted.

Corry, Pa.—The construction of 800 ft. of brick paving on Washington-st. and 500 ft. on South-st. is contemplated. C. B. Porter, cy. clk.

Hagerstown, Ind.—The town council has authorized the construction of two miles of cement walks and 17,000 sq. yds. street paving for this spring.

Baltimore, Md.—The estimated cost of brick for three streets is as follows: O'Donnell-st., $30,000; Steeper-st., $9,560; Patuxent-st., $19,350.

Terre Haute, Ind.—The residents of Sugar Creek township have petitioned for the grading and graveling of the Darwin, Paris and National roads.

Augusta, Ga.—Ordinances have been passed for repairing sundry sidewalks with brick and laying stone curbing. J. S. Patterson, clk. coun.

Gloversville, N. Y.—The construction of about 20,000 sq. yds. of brick paving is contemplated at a cost of about $46,843. C. Fiske, Jr., cy. engr.

Wallingford, Conn.—An appropriation of $3,000 has been voted for constructing about 1,700 ft. of state road. J. R. Campbell, councilman.

Council Bluffs, Ia.—Asphalt or brick paving is proposed for two streets this spring. Action has been deferred until April 6. Thos. Tostevin, cy. engr.

Atlanta, Ga.—The local wheelmen will endeavor to induce the city council to repave Pryor-st., between Mitchell and Peachtree, with asphalt or brick.

Richmond City, Cal.—The question of bonding for $310,000, for the construction of public highways from San Mateo to San Francisco, will be voted on April 2.

Springfield, Mass.—The street supervisors have voted to ask for an appropriation of $85,000 for the maintenance of streets and $65,000 for permanent work.

Boise City, Idaho.—Resolutions have been passed for constructing cement sidewalks in a large number of streets. M. Alexander, mayor; P. H. Blake, cy. clk.

Washington, Ind.—The council has passed a resolution for paving a number of streets with brick, aggregating about 21,900 sq. yds. T. J. Smiley, cy engr.

Irwin, Pa.—(Special.)—S. C. Remsberg, clk., says there has been no vote taken favorable to paving and sewer construction, and it is not probable that there will be for some time yet.

Malta, O.—A bill has been presented to the legislature to authorize the council of this village to issue bonds for the purpose of improving and repairing the streets.

Kansas City, Mo.—The petition to curb and pave Fourth-st., from Kansas to Osage-aves. has been favorably reported and the report adopted. Geo. E. Yeager, cy. clk.

Jacksonville, Ill.—The construction of one mile of brick paving on S. Diamond-st. and one-half mile on Webster-ave. is proposed. C. W. Brown, cy. engr.

Rockville, Md.—The construction of a macadam road, from Rockville to the District of Columbia, eight miles, and the Tennallytown road, from Rockville to Georgetown, is proposed.

Kansas City, Mo.—Ordinances for paving, curbing, guttering, parks and boulevards have been passed at the recommendation of the park board, which will result in an expenditure of $100,000.

Bluffton, Ind.—The city council passed resolutions, March 2, for about fifteen blocks of asphalt paving, with 5-ft. cement sidewalks; estimated cost of total improvement about $200,000.

Pana, Ill.—(Special.)—Hon. Warren Penwell says a petition has been presented to the local board of improvements to pave with brick, Locust-st., from Olive to Fourth, a distance of 2,000 ft.

Morgantown, W. Va.—The question of issuing $36,000 bonds for street paving was voted on March 26. The borough of South Morgantown ordered a bond election for street paving for March 21.

Decatur, Ill.—The property-owners of N. Union-st. are circulating a petition for paving for that street. The question of having asphalt or brick will be left to the majority of the signers.

Denver, Col.—Plans and specifications were ordered prepared March 17 for paving Logan-ave., from Eighth to Eleventh-aves., with granite taken from Sherman mountain, Wyoming.

Geneva, N. Y.—The board of public works is still undecided as to the relative merits of asphalt and brick pavements. About 14,000 sq. ft. of asphalt or brick paving will be laid this year, however.

Toledo, O.—Paving is proposed for Woodville-st. The board of works is in favor of repaving Atwater-st., between Rivard and Jos. Campau, and Franklin, between Brush and Dequindre-sts., with brick.

St. Paul, Minn.—The board of public works took final action March 15 on the proposed paving of Summit-ave., between Wabash and St. Peter-sts. The street will be paved with sandstone, with brick gutters.

Syracuse, N. Y.—Cedar, South, Salina, New Castle, Harrison, Bellevue, Lock and Northport-sts. will be paved with asphalt. The council has been petitioned to pave Shonrard-st., from S. West to Oswego, with asphalt.

Honolulu, Hawaii.—An estimate is said to have been submitted of needed appropriations, as follows: Opening of new streets, $10,900; street widening, $22,500; new steam road roller, $5,000; improving eight roads, $224,000. W. E. Rowell, supt. pub. wks.

Salem, Ill.—Messrs. John Leim, J. H. Vawter and John Shanofelt have been appointed a committee to investigate the probable cost of macadamizing Broadway, from the public square to the B. & O. Southwestern depot.

Oswego, N. Y.—(Special.)—F. J. O'Brien, supt. dept. of works, says the construction of about one-half mile of asphalt, vitrified brick or block stone paving is contemplated on E. Bridge-st. E. A. Cooke, clk. dept. works.

Brooklyn, N. Y.—The local board adopted a resolution March 9, ordering asphalt paving for Sixty-fifth-st., Manhattan, between Central Park, West and the Boulevard, and for repaving John-st., between Broadway and Pearl, with granite.

Buffalo, N. Y.—A resolution has been introduced directing the board of public works to readvertise for bids for resurfacing Niagara-st., from Porter-ave. to Niagara square, and also for repaving it and making the roadway two feet wider between curbs.

Omaha, Neb.—Paving has been proposed for Thirty-second-st., from Center to Gold, thence following the boulevard to the South Omaha line. A resolution has been passed to pave S. Eighth-st. The resolution specifies brick, but a number of the residents favor asphalt.

Louisville, Ky.—The board of public works has authorized the construction of Fourth-st., from the river to O'Neal's-alley, with brick, and the resurfacing of the other half of the block, from O'Neal's-alley to Main-st., with gravel and broken stone.

Richmond, Va.—The committee on streets adopted a resolution March 18 to pave Broad-st., from Tenth to Eleventh, with asphalt, at a cost of $7,400. The committee recommended asphalt paving for the west side of Twelfth-st., from Bank to Main. Chrmn. Allen.

Rockville, Conn.—The public works committee contemplates making a number of street improvements this year. The property-owners on upper Union-st. are in favor of asphalt paving. A petition is being circulated asking the common council to curb and gutter Pleasant-st.

Toronto, Ont.—City Engineer Rust, in a supplementary report to the board of works March 11, recommended the construction of a brick pavement on James-st., from Albert to Louisa, at a cost of $2,190; brick, Cowan-ave., $7,000; asphalt, College-st., $44,700.

Gloucester, Mass.—Special.—Winslow L. Webber, cy. engr., says that a bill has been presented to the legislature authorizing the city to expend $200,000 over and above its debt limit allowed by law for the purpose of constructing its principal highways.

Macon, Ga.—A resolution was introduced by Mayor Price March 15 and unanimously adopted by the aldermen, to authorize the board of public works to advertise for bids for paving with asphalt or brick any or all the streets heretofore selected to be paved.

Kansas City, Mo.—An ordinance has been passed for paving the Southwest boulevard, from Main to Broadway, Broadway to the Belt line bridge, and Twenty-fourth-st., from the Southwest boulevard to Fairmount-ave. Asphalt paving is recommended for Thirty-first-st., from Main to Holmes.

New York City.—The application of the Harlem Board of Commerce, asking that One Hundred and Twenty-fifth-st., from East

river to Manhattan-st., and Manhattan-st., from One Hundred and Twenty-fifth-st. to the Fort Lee Ferry, be paved with asphalt blocks, and Lenox-ave., from Central Park to the Harlem river, with asphalt, has been approved.

Detroit, Mich. — The board of public works visited the streets that are said to be in need of repairing March 16. The streets that need repairing, in the opinion of the aldermen, are as follows: Lincoln, cedar or asphalt; Twelfth, cedar; Fort, brick; Second, probably brick; Canfield, brick; Jay, cedar; Brush, brick; Fourteenth, cedar.

Hammond, Ind.—A declaratory resolution has been decided upon for macadamizing Sheffield-ave., between Gostlin-st. and Indiana-boulevard. A petition has been sent to Chairman Randolph's committee to macadamize Truman-ave., between Calumet and Charlotte-aves., and for the improvement of Logan-st., between Hohman-st. and Calumet-ave.

Utica, N. Y.—Resolutions were passed recently by common council designating asphalt as the kind of pavement to be laid in Blandina, Aiken, West, Eagle, Hicks, Tracy, Bleecker, Union and Court-sts Block sandstone paving will be laid in Court-st, between S Hamilton and a point about 100 ft. west of Phillip-st., and in Liberty-st., between Genesee and Seneca.

Ft Wayne, Ind.—Plans and specifications were adopted March 21 and bids will be asked at once for paving with asphalt Calhoun, S. Harrison, Suttenfield and W. Columbia-sts., and Woodfield and Hoagland-aves. W Creighton-ave. will be paved with asphalt blocks. The board of public works decided to invite competition in all of the best brands of asphalt.

Minneapolis, Minn.—The board of public works decided March 17 to advertise for bids for paving as follows: Asphalt—Sherburne-ave., from Cedar-st. to the easterly terminus; Sixth-st., from Sibley to Rosabel; Market, from Third to Sixth; Laurel-ave., from Nina-ave. to Dale; Ashland-ave., from Western-ave. to Dale-st.; Sherburne-ave., from Park-ave. to Cedar-st., will be paved with brick.

Newark, N. J.—Notices of intention were adopted March 15 for paving the following streets: Rose-st., from Monmouth to Barclay, with asphalt, and to Belmont-st. with granite; Waverly-ave., from Somerset to Barclay with asphalt and to Eighteenth-st. with granite; Lincoln-st., from Mercer to Court, with asphalt; Lock-st., from Central to Sussex-ave., with asphalt. Notices of intention were ordered March 22 for paving Stirling-st., between High and Howard, with brick, and Humboldt-st. with asphalt. Ordinances were passed March 25 to pave portions of Montgomery, Murray and Broome-sts. with sheet metal. Jas. M. Seymour, mayor.

Brighton, N. Y.—John T. Caley, Wm. N. Mumford and Howard A. Smith, the committee chosen recently to investigate the merits of cost of various kinds of pavements, presented its report March 17. The committee recommends trap-rock macadam paving. Messrs. Caley, Manning, Smith, Barnard, Blossom and Edmund Lyon were appointed a committee to assist the board of trustees in securing bids and getting the question of issuing bonds in shape to be voted upon by the taxpayers.

Indianapolis, Ind.—The property owners on Washington-st., between Alabama-st. and Senate-ave., decided, March 4, on asphalt paving with 4-ft. brick gutters. The Citizens' Street Railway Co. will pave between the tracks with vitrified brick on "stone foundation." Resolutions were adopted, March 24, for a gravel roadway, curbing and cement sidewalks on N. Tacoma-ave., from Tenth-st. to Pogue's run. Final action was also taken for wooden block paving on Market-st., from East to Noble; asphalt, Ohio-st., from East to Noble; wooden block, Fifteenth, from Illinois to Senate-ave.; wooden block, Fifteenth, from Central-ave. to College. Petitions have been filed for stone curbs and cement walks on Oriental-st., from Michigan to Tenth; brick paving in first alley east of College-ave., from Eleventh to Thirteenth; creosoted wooden block, New Jersey-st., from Washington-st. to Virginia-ave.; wooden block, cement sidewalk and curbing, Eleventh-st., from College-ave. to Ash-st.; asphalt and cement sidewalks, Roancke-st., from Ohio to New York. Resolutions were adopted, March 26, for cement sidewalks in Fifteenth and East-sts.

CONTRACTS TO BE LET.

Kansas City, Mo.—Bids are asked until April 2 for grading Prospect-ave. Thos. F. Callahan, co. surv.

Mt. Vernon, N. Y.—Bids are asked until April 5 for grading Depot Place. Wm. N. Hoyt, cy. clk.

Pittsburg, Pa.—Bids are asked until April 14 for improving two county roads. W. E. Thompson, co. con.

Muncie, Ind.—Sealed proposals will be received until April 11 for improving alleys. F. A. Elrod, cy. clk.

Buffalo, N. Y.—Bids are asked until April 5 for paving in several streets. R. G. Parsons, secy. B. P. W.

Trenton, N. J.—Bids are asked until April 12 for macadamizing White Hare road. N. H. Furman, Dir. Bd. Chosen Freenholders.

Eatontown, N. J.—Bids are asked until April 2 for constructing 3½ miles of macadam road. D. S. Morris, twp. clk.

Orange, Conn.—Bids are asked until April 2 for constructing a macadam road, 3,000 ft. long, on Savin-ave.

Milwaukee, Wis.—Bids will be received until April 21, according to press reports, for paving Main-st. with brick.

New Whatcom, Wash.—Bids will be received until April 5 for the completion of the Fair Haven-Lake Samish gravel road. Co. comrs.

Denver, Col.—Sealed proposals will be received until April 8 for asphalt paving on the Fourteenth-st. viaduct. Bd. pub. wks.

Evansville, Ind.—Bids will be received until April 12 for paving several streets with brick. Geo. W. Swearingen, clk. bd. pub. wks.

Cambridge, O.—Bids will be asked during April for paving Wheeling-ave. with repressed brick or Hallwood block. O. M. Hoge, cy. engr.

Tiffin, O.—Sealed bids will be received until April 4 for paving Water and Circular-sts. with brick. J. B. Ehrenfreied, cy. clk.

Milton, Mass.—Sealed proposals will be received until April 30 for grading and surfacing about six miles of roads. W. F. Bates, engr.

Lancaster, O.—Sealed proposals will be received until April 4 for paving Main-st., from Broad to Maple, with brick. H. T. Mechlin, cy. clk.

Paterson, N. J.—Bids are asked until April 4 for macadamizing portions of Lafayette, Ramapo and Fifth-aves. Jacob J. Van Noordt, dir. pub. wks

Ann Arbor, Mich.—Sealed proposals will be received until April 13, postponed from March 30, for asphalt and brick paving. Glen V. Mills, cy. clk.

Cincinnati, O.—Sealed proposals will be received until April 7 for paving with granite blocks Butler-st., from Front to Pearl. August Herrmann, prest. B. of A.

Albany, N. Y.—Sealed proposals will be received until April 12 for laying walks and other work around the state capitol. Geo. W. Aldridge, supt. pub. wks.

Wapakoneta, O.—(Special.)—Sealed proposals will be received until April 14 for grading, graveling, masonry and culverts on the Gossard and Hiett pikes. Samuel Craig, engr.

Mason City, Ia.—(Special.)—O. E. Stanley, cy. engr., says the council has advertised for bids until April 2 for 9,000 sq. yds. of brick paving and 3,000 lin. ft. of cement curb.

Kansas City, Mo.—Sealed proposals will be received until April 6 for grading Benton Harbor boulevard, between Twenty-fourth and Thirty-first-sts. Geo. E. Kessler, secy. bd. park. comrs.

Athens, O.—Sealed proposals will be received until Aprii 15 for the grading, excavating, foundation, limestone, graveling, etc., of 32 roads, aggregating about 148,546 feet. W. F. Scott, co. audt.

Flint, Mich.—Bids are asked until April 14 for 1,377 sq. yds. of brick paving, 1,377 sq. yds. of concrete and 413 cu. yds. of excavation in Detroit, N. Saginaw and Beach-sts. Fred P. Baker, cy. clk.

Batavia, O.—Sealed proposals will be received until April 14 for the construction of one-half mile of section No. 3, of the Williamsburg and Chillicothe free turnpike. John W. Davies, co. audt. and clk.

Waukesha, Wis.—Sealed proposals will be received until April 21 for paving Main-st., from West-ave. to Pleasant-st., with brick on concrete and with a hard limestone curbing. Wm. Powrie, prest. bd. pub. wks.

St. Paul, Minn.—Sealed proposals will be received until April 5 for the construction of a bicycle path on Martin-st., from Rice to Dale, and on Dale-st., from Martin to University-ave. Matt Jensen, cy. clk.

Mattoon, Ill.—Sealed proposals will be received until April 15 for the construction of concrete or brick sidewalks in portions of six streets, aggregating 25,189 ft. in length. D. P. Rose, chrmn. street and drainage com.

Toledo, O.—Sealed proposals will be received until April 4 for constructing stone road, No. 27, and until April 5 for constructing stone road, No. 26, by grading, draining, bridging and macadamizing. Wm. M. Godfrey, co. audt.

Cleveland, O.—Sealed proposals will be received until April 6 for paving with brick, curbing, etc., ten streets and avenues, and until April 13 for brick, Medina dressed block and stone paving in several streets. Geo. R. Warden, dir. pub. wks.

Omaha, Neb.—(Special.)—George McBride, county surveyor, says bids will be opened April 2 for paving the Dodge and Center street roads with macadam, stone blocks or vitrified brick. This will finish up an appropriation of $15,000 voted by the county for improving the roads.

Oshkosh, Wis.—Bids will be received until April 5 for paving Algoma-st., from Main to the W. C. tracks, with vitrified brick, and curbing and macadamizing Mt. Vernon-st., from N. Park-ave. to Quincy; Ceape-st., from Broad to Bowen; Pleasant-ave., from Merritt to Hudson; Scott-st., from Jackson to Main. Bd. pub. wks.

CONTRACTS AWARDED.

La Grange, Ill.—The contract for brick paving has been awarded to G. Maffioli of Rockford, Ill., for $18,182.

Elkhart, Ind.—The city council awarded a contract, March 2, to C. D. Budd of St. Louis, Mo., $52,415.50.

Atlantic City, N. J.—The contract for paving Michigan-ave. has been awarded to Kennedy Crossan at 97 cts. a sq. yd.

Macon, Ga.—The Georgia Quincy Granite company of this city has been awarded the contract for paving Poplar-st., at $2.53 a sq. yd.

Tacoma, Wash.—The contract for paving S. Tenth-st. with vitrified brick was awarded, March 11, to J. C. Dickson for $5,384.

Watertown, N. Y.—The contract for 800 sq. yds. of asphalt paving has been awarded to the Warren-Scharf Asphalt Paving company for $2,200.

Philadelphia, Pa.—The Alcatraz Asphalt Paving company was awarded the contract, March 7, for repairs to asphalt streets at 98 cts. a sq. yd.

May's Landing, N. J.—Quinlan & Leary of South Amboy has been awarded the contract for constructing a stone road from May's Landing to Egg Harbor for $10,000.

Kansas City, Mo.—The contract for paving Broadway, from Twenty-first to Twenty-third-sts., with vitrified brick was awarded to the Parker-Washington company.

St. Louis, Mo.—The contract for reconstructing the granite street that caved in with the collapse of the Mill creek sewer was awarder, March 21, to Robert Wykcoff for $1,173.35.

St. Paul, Minn.—The contract for constructing cement sidewalks during the ensuing year has been awarded to the St. Paul Sidewalk company at 70 cts. a running ft. for walks 6 ft. wide.

Bangor, Me.—The contract for furnishing 1,000 lin. ft. of granite curbing has been awarded to J. S. Condon at 23 cents per lin. ft., and for 100,000 granite paving blocks to Chatto & Condon at $32.77 per thousand.

Atlanta, Ga.—The Southern Asphalt Paving company of Baltimore, Md., was awarded a contract for paving Drayton-st. with Alcatraz asphalt at $1.91 a sq. yd.

Independence, Mo.—The contract for macadamizing Lee's Summit and the Atherton road has been awarded as follows: Lee's Summit, 2 miles, Collier Bros., $1.06¾ a cu. yd.; Atherton road, 2 miles, Jno. May, $1.09

Schenectady, N. Y.—Bids were received for paving Albany-st. with Catskill brick as follows: Chambers & Casey, Rochester, N. Y., $2.20 a sq. yd.; Edward Harrington, $1.73; John Toomey, $1.59; Erbeck Bros., $1.74; Benjamin Van Wrankin, $1.59¾.

Vernon, Ind.—Contracts for constructing 8½ miles of pike road in Center township were awarded to the following contractors: Div. 2, Richard B. Lawson, Madison, Ind., $5,411.10; Div. 3, Harmon Bros., Stillinger & Lee, Vernon, Ind., $5,915.61; Div. 1, Hayes & Phillips, $4,012.37.

Toledo, O.—The Warren Scharf Asphalt Paving Co. submitted the lowest bid for asphalt paving in Scottwood-ave., from Virginia-st. to Laskey-ave., at $1.80 a sq. yd. The contract for paving Collingwood-ave. was awarded to Frank Cole, March 21, at $1.19 a sq. yd., or a total of about $30,000.

Philadelphia, Pa.—Contracts were awarded March 14 for street repairs as follows: Cobble, rubble and block streets on gravel foundations, Michael O'Rorke, 19 cts. a sq. yd.; asphalt block streets, Michael O'Rorke, $1.40 a sq. yd.; vitrified brick streets, Mack Paving Co., 75 cts. on gravel base, and $1.20 on concrete base.

Syracuse, N. Y.—Contracts for furnishing the material needed for the streets of this city were awarded March 14 as follows: Granite blocks, Winnsboro Granite Co., $51 per thousand; blue stone flagging and curbing, John Maxwell & Sons; terra cotta pipe, J. V. Brandt. The contract for furnishing cement gravel has not been awarded.

San Francisco, Cal.—Bids have been received for paving Market-st. with bitumen as follows: City Street Improvement Co., $20,000, and $5,000 allowance for old material; Pacific Paving Co., $23,750, with $100 allowance; San Francisco Paving Co., $25,850, with no allowance; Fred J. French, $35,857, with $1 allowance; Alcatraz Asphalt Co., $26,241.30, with no allowance.

Indianapolis, Ind.—Contracts were awarded March 22 as follows: Gravel roadway, brick gutters, cement sidewalks and curbing, Annetta-st., from Thirtieth to Thirty-first, Daniel Foley, $1.75 a lin. ft. each side; brick sidewalk in Elizabeth-st., from Maxwell to Wilson, Indiana Improvement Co., 35 cts. a lin. ft. each side; cement sidewalks, Delaware-st., Twenty-second to Twenty-third, Indiana Improvement Co., 76¾ cts. a lin. ft. each side.

Albany, N. Y.—Paving contracts have been awarded during March as follows: Second-st., from Colby-st. to Watervliet-ave., brick, T. Henry Dumary, $7,510.30; Hunter-ave., from Colby-st. to Watervliet-ave., Mulderry Bros., $6,528.05; contracts awarded March 7. The contract was let March 21 to T. Henry Dumary for constructing brick paving on Monroe-st., from Pearl to Cross, at $1.70 a sq. yd., or $4,736.80.

Buffalo, N. Y.—The contract for furnishing such hard Medina sandstone paving blocks, etc., as may be required during the year, has been awarded to P. B. McNaughton as follows: Hard Medina sandstone paving blocks, $9.54 a cord of 128 ft. measurement; 24-in. crosswalk, 30 cts. a lin. ft.; 18-in. crosswalk, 28 cts.; 18-in. curbing, 25 cts.; flat gutter stones, 18 cts.; platform stones, 75 cts. The Barber Asphalt Paving Co. has been awarded a contract for paving Landon-st., from Humboldt parkway to Filmore-ave., with asphalt for $8,732.

Saginaw, Mich.—The contract for paving Germania-ave., from Tilden to Genesee-sts., with brick, was awarded March 18 to John C. Schultz as follows: Excavation, 16 cts. a cu. yd.; brick paving, $1.02 a sq. yd.; tile drain, 65 cts. a lin. ft.; curb stone, 50 cts. a lin. ft. Bids were received the same day for paving Hamilton-st. and Jefferson-ave., the Barber Asphalt Co. presenting the lowest bid, $1.33 a sq. yd. The Alcatraz Construction Co. bid $1.38 and the Columbia Construction Co. bid $1.42 on N. Jefferson-ave., and $1.44 on Hamilton-st. The common council on March 22 referred the matter of accepting the Barber Paving Co.'s bid on Hamilton-st. to the West Side committee on pavements and sewers. The contract for paving N. Jefferson-ave. was awarded to the Barber Asphalt Paving Co.

Newport, Ky.—(Special.)—W. L. Glazier, cy. engr., says the contract for paving Third-st., from York to Monmouth, was awarded March 16 to M. T. Flynn of Cincinnati at the following prices: 5-in. curb, straight, 825 ft., 75 cts. a lin. ft.; 5-in. curved curb, 40 ft., $1.50; resettting curb, 30 ft., 10 cts.; brick paving, Athens block, 1,800 sq. yds., 50 cts. a sq. yd.; concrete foundation, 1,800 sq. yds., 55 cts.; old limestone repaving, 10 sq. yds., 50 cts.; 3-in. drain tile, 100 ft., 3 cts.; excavation, 1,000 cu. yds., 25 cts.; remodeling catch basin, 50 cts.; total, $2,830.25.

Syracuse, N. Y.—Bids were received March 22 for paving with asphalt, asphaltum or brick, as follows: Irving-ave.—Warren-Scharf Asphalt Paving Co., Trinidad asphalt, $5,286.10; C. T. Hookaway, N. Y. Brick & Paving Co., brick, $4,203.20; A. S. Webb, N. Y. Paving & Brick Co., brick, $4,246; Asphaltina Construction Co., Alcatraz asphalt, $5,184. Merriam-ave.—Asphaltina Construction Co., $44,456.12. S. Salina-st.—Columbia Construction Co., Trinidad asphalt, $44,943.12; Warren-Scharf Asphalt Paving Co., Trinidad asphalt, $46,598.01; Empire Construction Co., Alcatraz asphalt, $48,155.82.

Buffalo, N. Y.—The Barber Asphalt Paving Co. secured contracts March 16 for repairing the asphalt pavements as follows: Resurfacing, $1.05; skimming, 6 cts.; replacing concrete, $1.90; scraping joints, 2 cts.; cleaning and filling cracks, 1ct.; replacing stone along railway tracks, 15 cts. The other companies bidding on the work were the American Construction Co., Columbia Construction Co and Utica Paving Co., Henry P. Burgard, German Rock Asphalt Co. Bids were received March 23 for repaving Pearl-st., between The Terrace and Tupper, and Leamington Place, with asphalt. The Barber Asphalt Co. was the lowest bidder on Pearl-st., $32,736, and the Utica Paving Co. was the lowest bidder on Leamington Place, at 54.464.

Indianapolis, Ind.—Bids were received March 28 for seventeen improvements and referred to the city engineer for examination. On Tnirteenth, from Central to College, asphalt, the bids ranged from $3.22 to $5.49 per lineal foot; Pratt-st., wooden block, from $3.22 to $4.93; Alabama-st. to Ft. Wayne, wooden block, from $2.59 to $3.50; Washington, Rural to Belt R. R., asphalt, from $5.80 to $5.92; New Jersey, from Sixteenth to Nineteenth, asphalt, cement walks, curbing and sodding lawns, from $4.75 to $4.94; Southeastern-ave., from Washington to State, wooden blocks, from $5.08 to $6.41; Tenth-st., from Illinois to Senate, wooden blocks, from $3.21 to $5.07, and from Meridian to Illinois, from $2.73 to $3.50; Eleventh-st., from Capitol to Senate, asphalt, from $3.92 to $4.10.

SEWERS.

Winona, Minn.—(Special.)—L. W. Frost, rec., says that nothing has been done regarding the proposed sewer construction beyond the report of the sewerage committee,

which recommended the improvement. It may have a hearing, but the probabilities are that that will be the end of it. There seems to be much strong feeling against it.

CONTEMPLATED WORK.

Yureka, Cal.—A sewerage system will be constructed north of Miner-st.

Parkersburg, W. Va.—A sewer 6,000 ft. long will be constructed.

Greenville, Miss.—The construction of a sewerage system is contemplated.

Lebanon, N. H.—About $2,000 will be expended for constructing sewers.

Dedham, Mass.—The construction of a sewerage system is contemplated.

Manchester, N. H.—An appropriation of $30,000 for new sewers has been made.

Lacon, Ill.—This county will construct one-half mile of sewers. T. A. Connell, cy. clk.

Washington, Pa.—The issue of $60,000 bonds for a sewerage system and paving is proposed.

Springfield, Ill.—About two miles of small sewers may be laid. Frank H. Hamilton, cy. engr.

Norristown, Pa.—Storm sewers are to be built on several streets. M. D. Patterson, cy. engr.

Westfield, N. Y.—The question of constructing a sewerage system is being considered.

Rockville, Conn.—Surveys are being made for the completion of the sewerage system.

Merrill, Wis.—The construction of a main sewer is contemplated. G. R. Sturtevant, cy. engr.

Keokuk, Ia.—The city council contemplates extending the sewerage system at an expenditure of $7,500.

Augusta, Ga.—The council has voted to construct two 12 and 15-inch pipe sewers. Patrick Walsh, mayor.

Asheville, N. C.—The construction of about one mile of sewers is contemplated. M. W. Robertson, cy. clk.

Warrensburg, Mo.—The city council is taking steps preparatory to furnishing the Pine-st. sewer.

North Adams, Mass.—This city contemplates borrowing $50,000 to be expended in building sewers.

Mobile, Ala.—The plans for the proposed sewerage system have been prepared and submitted by Geo. G. Earle.

East Liverpool, O.—The plans for a sewerage system have been approved by the board of health.

Seattle, Wash.—The extension and improvement of the sewers is contemplated at a cost of $44,900.

Glens Falls, N. Y.—The construction of sewers in certain streets is proposed. Geo. P. Slade, cy. engr.

Waterbury, Conn. The board of public works has recommended the construction of sewers at a cost of about $20,000.

Paterson, N. J.—The construction of 2,100 ft. of 30-inch brick sewer is contemplated. Wm. Ferguson, cy. engr.

Bellefontaine, O.—An issue of $30,000 for the proposed sewerage system has been recommended. Robert Lamb, chrmn. com.

Wabash, Ind.—A resolution was passed by the board of commissioners to construct a sanitary sewer in Miami-st.

Pittsburg, Pa.—Ordinances were passed by the common council March 14 for constructing sewers in a number of streets.

Rockford, Ill.—Petitions have been received for about one mile of 8 to 15-in. sewer on Eighth-st. Edwin Main, cy. engr.

Peru, Ind.—The construction of about 6,000 ft. of 20-in. tile sewers is contemplated. Peter Kelly, cy. engr.

Washington, Ind.—The construction of 800 ft. of 24-in. sewer is contemplated. T. J. Smiley, cy. engr.

Binghamton, N. Y.—Specifications have been ordered prepared for pipe sewers. B. W. Mosher, cy. clk.

Oshkosh, Wis.—The construction of about 4,000 ft. of sewers is contemplated. Dan Witzel, cy. clerk.

Redfield, S. D.—The council contemplates the construction of a sewer in Humboldt-st., from Franklin-ave. to Turtle creeek.

Oswego, N. Y.—(Special.)—Petitions have been received for about one mile of tile sewers. F. J. O'Brien, supt. dep. wks.

Auburn, N. Y.—This city contemplates constructing about 3,000 ft. of 15 to 8-in. pipe sewers. D. F. Austin, cy. engr.

Waynesburg, Pa.—Plans are being prepared for a sewerage system for this place by E. J. Millar of Wheeling, W. Va.

Westfield, N. J.—The question of constructing a sewerage system was favorably voted on March 8. J. G. Finley, cy. clk.

Portsmouth, O.—The immediate construction of a system of sewers in the First district is said to have been recommended.

Meriden, Conn.—About 20,000 ft. of sewers are to be built, the work to be done by day labor. W. S. Clark, cy. engr.

Corry, Pa.—The construction of a sewer in Congress-st. is contemplated at a cost of $25,000. C. E. Porter, cy. clk.

North Bay City, Mich.—The construction of a 12-in. pipe sewer in Linn-st. has been recommended. G. L. Luske, cy. clk.

Reading, Pa.—The construction of 840 ft. of sewer, at a cost of about $18,000, is contemplated. Samuel A. Hoff, cy. engr.

Bar Harbor, Me.—This town has voted to expend $10,000 for the construction of sewers. S. M. Rich, Salisbury, Me., interested.

Marion, Ind.—The plans, specifications and details for the proposed sewer, proposed by City Engineer Overman and Engineer Todd, have been placed in the hands of the sewerage committee.

Andover, Mass.—An appropriation of $80,000 has been made for constructing a sewerage system from plans and specifications made by McClintock & Woodfall of Boston.

Cambridge, O.,—Plans and specifications have been prepared and bids will be advertised about April 15 for constructing a trunk and tile sewers in certain streets. O. M. Hoge, cy. engr.

Mt. Gretna, Pa.—James H. Fuertes, C. E., of New York City, assisted by Geo. W. Hayes, city engineer of Lebanon, Pa., will have charge of the proposed sewerage system at the Pennsylvania Chautauqua, this place.

Cripple Creek, Col.—An ordinance was passed by the city council March 16, providing for the purchase of the city sewer system owned by the Cripple Creek Sewerage company at about $65,000.

Chicago, Ill.—Plans are being prepared for taking up five miles of 12-in. tile sewers in Woodlawn, built before annexation, and replacing them with brick sewers. The work will be paid for by special assessment at a cost of about $125,000.

Springfield, Mass.—The question of constructing the Mill river intersecting sewer is under consideration and may be ordered within a few weeks. Chas. M. Slocum, cy. engr.

Champaign, Ill.—The construction of an iron sewer, instead of a brick sewer, was decided upon March 17. It will be circular, 36-ins. in diameter for 2,600 ft. and 36-ins. for 3,800 ft.

Denver Col. — A resolution has been adopted by the board of public works. March 15, to construct a sanitary sewer embracing blocks 1, 2, 12 and 13 in Potter Highlands addition.

Hammond, Ind.—Declaratory resolutions were adopted, March 21, for the construction of a 48-in. brick sewer in Hohman-st., between Grand Calumet river and Douglas-st.

Canton, O.—(Special.)—The council has passed an ordinance to build a sanitary sewer in Woodland-ave. The legislature will be petitioned for authority to issue $75,000 bonds for sewering Shriver's run.

Newark, N. J.—An ordinance providing for a pipe sewer in Sixth-ave. and Ridge-st. passed to third reading March 24. Ordinances were passed and approved, March 25, for sewers in Quitman, Prince, S. Seventh and Fifth-sts. and Morris and Seventh-aves. Jas. M. Seymour, mayor.

Woodbury, N. J.—The plans prepared two years ago by Waring, Chapman & Farquhar, New York, for a sewerage system for this place, have been purchased. The bill providing for building sewers in third-class cities was passed recently by the legislature, and this city will now have to submit the question to vote before it can take further action. D. T. Mathers, cy. clk.

The question of issuing bonds for the construction of sewerage systems will be voted on at the following places: Marshfield, Wis., April 5; Columbia, Mo., in April; Winooski, Vt., April 13; Sag Harbor, L. I., N. Y., April 4; Cambridge, O., April 4; South Bethlehem, Pa., Winton Place, O., April 4; Longmeadow, Mass., April 4; El Paso, Tex., in April; Holland, Mich, April 4; Wyandotte, Mich., in April.

CONTRACTS TO BE LET.

Muncie, Ind.—Bids are asked until April 11 for constructing sewers in several streets. F. A. Elrod, cy. clk.

Cambridge, O.—Bids will be asked in April, according to report, for constructing certain sewers. O. M. Hoge, cy. engr.

Union City, Ind.—Bids are asked until April 4 for constructing an extension to the Pearl-st. sewer. S. R. Bell, cy. engr.

Albany, N. Y.—Bids are asked until April 4 for constructing a vitrified pipe sewer in McCarthy-ave. Thos. J. Lanahan, clk. bd. contract.

St. Joseph, Mo.—Bids ars asked until April 7 for constructing sewers, drains, curbing and macadamizing in the Asylum road. Theo. Steinacker, co. surv.

Chicago, Ill.—Bids are asked until April 13 for the construction of main conduits for intercepting sewers in Sections C and D. L. E. McGann, comr. pub. wks.

Chillicothe, O.—Sealed proposals will be received until April 2 for the construction of a sanitary sewer in Second-st. Wallace D. Yaple, clk. bd. sewer comrs.

Ann Arbor, Mich.—Bills will be received until April 13, postponed from March 30, for constructing about one mile of vitrified crock sewer, with thirty catchbasins. Glen V. Mills, cy. clk.

Milton, Mass.—Bids are asked until April 2 for constructing about 1½ miles of pipe sewers. The brick, pipe, cement and castings will be furnished by the town. W. F. Bates, cy. engr.

Anaconda, Mont.—Bids will be received until April 14 for the construction of sewers in Special Improvement District No. 3, 4 and 5, and for a main sewer in W. Fourth-st. T. O'Leary, cy. clk.

Chamberlain, S. D.—Sealed proposals will be received until April 5 for constructing a sewerage and water works system, including an artesian well. John Flinn, supt. Indian Industrial School.

Columbia City, Ind.—Sealed proposals will be received until April 7 for the construction of a general system of storm and sanitary sewers for a portion of this city. E. K. Strong, city civil engineer.

Mt. Vernon, N. Y.—Sealed proposals will be received until April 5 for the construction of receiving basins with drain at the intersection of E. First-st. and Franklin-ave. Wm. N. Hoyt, cy. clk.

Cleveland, O.—Sealed proposals will be received until April 6 for constructing sewers in Watterson, Junction and Train-sts.; until April 13 for sewers in three streets; until April 21 for constructing a main sewer on Garden-st. Geo. R. Warden, dir. pub. works.

Worcester, Mass.—Proposals will be received until April 5 for 2,000 barrels sand, 5,000 barrels Portland cement, 7,000 barrels Rosendale cement, 300 manhole castings, 100 catchbasin castings, 2,500,000 brick, 3,500 tons lime, 100 sets catchbasin stone, 3 mls. vitrified pipe, two miles cement pipe. Harrison P. Eddy, supt. sewers.

CONTRACTS AWARDED.

Elizabeth, N. J.—The contract for constructing a sewer in Broad-st. has been awarded to Matthew Wade for $6,995.

Indianapolis, Ind.—M. M. Defrees was awarded the contract March 19 for constructing a sewer in Market-st. at $3.92 a lin. ft.

Tampa, Fla.—The contract for constructing sewers was awarded Feb. 28 to Jacob S. Friday & Sons of Charleston, S. C., and Pittsburg, Pa., for $34,002.

Kenosha, Wis.—The contract for constructing from 5,000 to 6,000 ft. of brick sewer has been awarded to Harding & Nelson of Racine for about $12,000.

Pittston, Pa.—The contract for constructing an entire sewerage system for Guadalajara, Mexico, has been awarded to John H. Foy of this city for about $1,666,000. About 100 miles of pipe will be used.

Toledo, O.—Sewer contracts were awarded March 10 as follows: New York-ave., Geo. H. Bodette, $4,212.45; First-st., $2,283.50; alley south of Chicago-st., $1,506, and Second-st., $2,065.90, Henry Sheehan.

Erie, Pa.—(Special.)—B. E. Briggs, cy. engr., says the contract for constructing 2,010 ft. of 18-12-in. tile sewer in Eighteenth-st., between Ash and Perry, was awarded to John McCormick & Son for $3,873.60.

Terre Haute, Ind.—Bids were received for constructing 6 2-3 miles of brick sewers. The bide were based on the Canal and Hulman systems. The bids on the canal system ranged from $67,810, the bid of the Indiana Construction company of this city, to $112,078.

the bid of W. C. Evans & Co. of Peoria, Ill. Those on the Hulman system ranged from $50,460 to $85,415, these two bids being submitted by the above companies.

Chicago, Ill.—Contracts were awarded for building the Twelfth and Twenty-second-st. intercepting sewers, as follows: Twelfth-st., James H. Roche, $28,041; Twenty-second-st., Byrne & Shortal, $65,950.

Hammond, Ind.—The contract for constructing an 18-in. tile sewer in Gostlin-st., between Hickman and Hohman-sts., was awarded March 21 to the James Nelson Co. of South Bend at 76 cents a lin. ft. and 12 cents a lin. ft. for house drains.

East St. Louis, Ill.—Bids were received recently for constructing sewers in Tenth, S. Tenth, N. St. Clair-ave., E. St. Clair-ave. and Ninth-sts. The bids ranged as follows: 30-in. pipe, $1.48 to $2.25; 30-in. pipe, $1.56 to $1.80; 24-in. pipe, 62 to 81 cts.; 20-in. pipe, 38 to 60 cts.; 18-in. pipe, 32 to 55 cts.; 15-in. pipe, 20 to 31 cts.; 12-in. pipe, 18 to 35 cts.; 10-in. pipe, 14 to 30 cts.

Cleveland, O.—The lowest bids received for sewer construction were as follows: Shaw-st., $1,399.95; Brenton-st., $2,953.10 August Helm. Simon-st., $1,961.74; Korman-st., $2,476.66; William Lehman. Brainerd-st., $1.19 J. Connelly & Son. Campbell Bros presented the lowest bid March 21 for the repair of a caved-in sewer at the Cleveland work house, $1,064.70, and the contract will probably be awarded them. The contract for constructing a storm overflow outlet across Edgewater Park was awarded March 18 to Ford P. Beers for $27,069.

WATER-WORKS.

Chicago, Ill.—L. E. McGann, commissioner of public works, is taking precautions to prevent a water famine during the coming summer. Needed repairs will be made in every pumping station and the capacity materially increased. About 37½ miles of water mains, including ¼ mile of 48-in., 19 miles of 36-in. 3½ miles of 30-in., 5½ miles of 24-in., 7½ miles of 16-in. and 1¾ miles of 12-in. pipe will be laid.

Delphos, O.—The water works trustees decided March 17 to accept no more applications for taps, contract no further debts and suspend the operation of the plant when the remaining cash which they have in the treasury is gone. The fund is deplete and the system not being self-sustaining yet, the trustees asked the council for $5,000. The council did not seem disposed to make the appropriation, hence the decision of the trustees.

Minneapolis, Minn.—A series of chemical and bacteriological analyses made by Gas Inspector Meers and City Engineer Cappelen shows that the reservoir exerts a purifying influence on the city water. The water pumped to the reservoir and allowed to settle before distribution has a smaller percentage of impurities, is lower in the amount of chlorine, free from albuminous ammonia and other dangerous elements, and there is less sediment and fewer bacteria than in the water at the North Side pumping station, from whence the reservoir is supplied.

Boston, Mass.—The waters of the Wachuset reservoir has been turned into the distributing service channels. This is the third great system for supplying Boston. The first of these supplies was the Cochituate, opened fifty years ago, which delivered 16,000,000 gallons daily, and was looked on as a wonder at first. The second was the Sudbury, in 1878. This last supply delivers 100,000,000 gallons, and when the permanent dam is built it will deliver 300,000,000 gallons each twenty-four hours. The reservoir will retain over 63,000,000,000 gallons.

CONTEMPLATED WORK.

Rockland, Mass.—New boilers are to be installed at the pumping station.

Worcester, Mass.—Bids will soon be asked for water pipe. E. H. Towne, cy clk.

Attica, Ind.—The construction of a new reservoir is contemplated by the council.

Rock Island, Ill.—The construction of a reservoir is contemplated. A. D. Thusing, cy. clk.

Corning, N. Y.—About $3,500 will be expended in extending the water works. F. J. Bantley, cy. clk.

Sault Ste. Marie, Mich.—A new pumping station will be erected this season. H. C. Thompson, cy. engr.

Southington, Conn.—The construction of a new storage reservoir is contemplated. F. H. McKenzie, cy. engr.

Springfield, Ill.—About 26,000 ft. of 20-10-6-in. pipe will be laid. Frank H. Hamilton, cy. engr.

The question of constructing water works is being agitated at Pella, Ia., and Milo, O.

Trenton, Tenn.—This city voted in favor of municipal ownership of the water works and light plant March 16.

Morris, Minn.—Plans for a water works system are being prepared by the Iowa Engineering Co. of Clinton, Ia.

Needham, Mass.—The legislature has been asked for permission to issue $50,000 bonds for increasing the water supply.

Santa Ana, Cal.—A centrifugal pump will be installed at the water works according to report. E. D. Atwood, ch. pump engr.

Italy, Tex.—The purchase of pumps, standpipe, mains, etc., is contemplated by the Italy Water Co. Leon Levy, secy.

Auburr, N. Y.—About 17,000 ft. of new mains and replacing old cement pipe is under consideration. D. F. Austin, cy. engr.

Cedar Rapids, Ia.—A 3,000,000 gallon pump will be put in and other improvements made at a cost of $35,000, by the Cedar Rapids Water Co.

Oil City, Pa.—The council has voted to ask bids for a new 2,000,000 gal. pump for the water works. Councilman Eckmeder.

Bolivar, N. Y.—The board voted favorably, March 15, to grant a franchise for water works to any company. B. S. Dunn, vil. clk.

Lansingburgh, N. Y.—The bill authorizing this town to borrow $60,000 for water purposes has been signed by the governor.

Rideauville, Ont.—The advisability of granting a franchise for water works and an electric light plant is under consideration.

Boston, Mass.—Proposals will be received soon for laying about three miles of 36-in. cast iron water pipes and for building a 40,000,000 gal. high service reservoir.

Des Moines, Ia.—The city council decided, March 15, to accept the proposition of John W. Hill, C. E., of Cincinnati, to complete the plans for a municipal water works plant.

Cohoes, N. Y.—A bill was introduced, March 21, authorizing the city to bond itself for $15,000 to lay new and larger water mains from the reservoir to the city.

St. Charles, Minn.—Mayor Bennett and the committee on fire protection have been instructed to get prices on a pump for the water works.

Brooklyn, N. Y.—The board of public improvements is considering the question of issuing $2,300,000 bonds for increasing the water supply of this city.

Meadville, Pa.—The question of issuing $150,000 bonds for the purchase of the plant of the Meadville Water company will be voted on April 7. W. A. Doane, cy. engr.

Williamsburg, Mass.—A committee has been appointed to investigate the construction of a water works system. G. M. Bradford, W. M. Purrington, Byron Loomis, Henry W. Hill and C. B. Hosford, com.

Colton, Cal.—An ordinance of intention has been passed to purchase pumps, electrical machinery and to construct water mains and reservoirs. Plans and estimates have been prepared by J. B. Pope, Spec. cy. engr. D. Johnston, cy. clk.

Gallatin, Tenn.—A committee was appointed, March 18, to act in conjunction with the citizens' committee relative to the most feasible plan for a water works system. The committee consists of Aldermen Spillers, Schamberger and Buchanan, and Citizens Beebe, Levy and Blackmore.

Wheeling, W. Va.—A new 12,000,000 gallon pump will be purchased this spring for the pumping station. Prest. Henry F. Jones, Secretary John E. Shellhouse and Dr. C. F. Ulrich of the city water board, visited several cities, March 14, 15, and 16, to inspect pumping plants and pumping machinery.

The construction of water works systems are contemplated at the following places: Abingdon, Ill.; Harmony, Minn.; Steuben, N. Y.; Antioch, Ill.; Pine Island, Minn.; Morton, Minn.; Florence, S. C.; Pierceton, Ind.; Friendship, Me.; Monroeville, Ala.; McComb, Miss.; Mena, Ark.; Sweetwater, Tex.; Monroe, Utah.

The question of issuing bonds for the construction of water works has been favorably voted on at the following places: New Paynesville, Minn.; Tripp, S. D.; Elba, Minn.; Caldwell, O.; Charlottesville, Va.; Boyne City, Mich.; Montour Falls, N. Y.; Prattsburg, N. Y.; Oakland, Md.; Martin, Tenn.; Georgetown, Del.; Cattarangus, N. Y.

CONTRACTS TO BE LET.

Auburn, Ind.—Bids will be received until April 20 for the construction of water works. J. J. Van Auken, cy. engr.

Kingfield, Me.—Bids will be received until April 20 for constructing a water works system. Kingfield Water Co.

Fargo, N. D.—Bids will be received until April 4 for a new boiler and pump for the water works. J. Tudor Graves, cy. engr.

Mineral Point, Wis.—Sealed proposals will be received until April 19 for constructing a system of water works. Gay P. Cobb, mayor.

Yreka, Cal.—Bids are wanted until April 4 for constructing a tank house and pumping plant at Siskiyou Co. hospital. Allen Newton, clk.

Odebolt, Ia.—Sealed proposals will be received until April 5 for the erection of a steel water tower and road tank. H. Hanson, chrmn. water com.

Rockville, S. C.—Proposals will be received until April 9 for supplying the city with water, to be furnished from artesian or deep wells. Chrmn. com.

Ridgewood, N. J.—Sealed proposals will be received until May 25 for building a water plant and furnishing a pure and wholesome water supply. H. G. Ward, vil. clk.

Cincinnati, O.—Sealed proposals will be received until April 28 for constructing an intake pier, tunnel and pump pit for the Eastern pumping station, near California, O. Aug. Herrmann, prest. B. of A.

New York City—Offers will be received until May 1 for laying 12,000 ft. of 10-in. cast iron water main along and through a public highway between Seneca Falls and Waterloo. Harry A. Thompson, engr., 66 Broadway.

Perth Amboy, N. J.—Bids are asked until April 4 for furnishing and erecting a pumping engine of 4,000,000 gals. capacity in 24 hours, one air pump, one boiler feed pump and foundations, connections, valves, etc. Geo. W. Eggert, supt. w. w.

CONTRACTS AWARDED.

Union Grove, Wis.—A franchise for a water works system has been granted to Wm. Hardy.

Ortonville, Minn.—The contract for constructing a water works and electric light plant has been awarded to Patrick Doherty of St. Paul.

Oregon, Mo.—B. P. Egan of Nebraska City, Neb., has been awarded the contract for a water works system in this town for $18,350.

Butte, Mont.—A contract has been let to Winter, Parsons & Bonner for constructing a settling and auxiliary reservoir a mile and a half above the dam of the main reservoir for $30,000.

Terre Haute, Ind.—An ordinance was passed March 8 granting a franchise to the Manufacturers' Water company, which will expire in 1921. The company is to pay to the city 2 per cent. of gross receipts after ten years and for fire plugs at $30, instead of $40, as charged by the old company.

BRIDGES.

Colfax, Ia.—A new iron bridge will be constructed over Skunk river.

Ft. Wayne, Ind.—A contract will be let during April for building a bridge over the Maumee river at Walton-ave.

Egremont, Mass.—This town voted March 21 to build new iron bridges at North and South Egremont.

Lansing, Mich.—The question of building a bridge across Grand river at Kalamazoo-st. will be voted on April 5.

Perry, Pa.—A new iron bridge has been asked for by the citizens of Shoemakersville, at a cost of about $1,200.

Grand Forks, N. D.—Bids will be received until April 4 for constructing any or all bridges during 1898. J. W. Scott, co. audt.

Chicago, Ill.—Bids are asked until May 18 for building certain bridge superstructures along the Main Drainage Channel.

Buffalo, N. Y.—The board of aldermen voted March 17 to place $50,000 in the estimates for the construction of a bridge across Buffalo river, at the foot of Commercial-st., and $25,000 for a bridge over the river at Seneca-st.

Anoka, Minn.—The Wrought Iron Bridge Co., of Canton, O., has been awarded the contract for building an iron bridge across Rum river.

Elyria, O.—The question of building a bridge at Third-st. is being considered. A. B. Hayes, C. E. Wilson and F. E. Griffin, com.

Lecompton, Kas.—Bids are asked until April 11 for constructing a steel bridge across the Kansas river. Henry Dick, co. clk., Lawrence, Kas.

Chattanooga, Tenn.—Plans have been completed by County Engineer Betts for a new steel bridge over the Chattanooga creek on Mountain-ave.

Lebanon, Pa.—The commissioners have decided to build a new bridge over the Quittapahilla creek, near Union Forge. James M. Snyder, clk.

Torrington, Conn.—Plans and surveys have been made for a new bridge across the Naugatuck river; estimated cost between $17,000 and $18,000.

Cumberland, Md.—The construction of six iron bridges along George's creek, in the mining region, is contemplated by the Allegany county commissioners.

New Whatcom, Wash.—Bids are asked until May 3 for constructing a combination bridge across Woosack river, on the Guide Meridian road. Alex Van Wyck, co. audt.

Denver, Col.—Sealed proposals will be received until April 9 for the erection of an 80x14-ft. highway bride on masonry. Highway comrs. of Blue Ridge twp., Pitt Co.

Dayton, O.—The question of issuing $250,000 bonds for the construction of bridges across the Miami river, at W. Third and N. Main-sts., will be voted on this spring.

Hamilton, O.—A petition has been presented to the county commissioners asking for a bridge over Four-Mile, or Seven-Mile creek, on the West Elkton pike, in St. Clair township.

Wadsworth, Ill.—Bids are asked until April 8 for constructing a steel bridge, with stone abutments, over the O'Plain river, east of Rosenkrans. J. G. Bensinger, town clk.

Madison, Neb.—Bids will be received until May 4 for the construction of a bridge across the Elkhorn river one mile north of Meadow Grove. E. G. Heilman, co. clk.

Charles City, Ia.—Bids will be received until April 4 for constructing pile and combination bridges to be repaired and built during the year. W. D. Lindman, co. audt.

Iowa City, Ia.—Bids will be received until April 8 for constructing iron, wood and steel bridge, in lengths of 100 ft. and under, during year 1898. T. F. Crowley, co. audt.

Greenbay, Wis.—The question of issuing $19,000 bonds for rebuilding Walnut-st. bridge and erecting a new bridge over East river at Webster-ave. will be voted on April 5. Mayor Desnoyers.

Gonzales, Tex.—Bids and plans will be received until May 11 for the construction of an iron, steel or wire bridge across the San Marcos river at Slayden, ten miles above this city. W. W. Glass, co. judge.

Trenton, N. J.—Bids are asked until April 12 for erecting a combination steel beam, brick arch and concrete bridge over Golden Run creek, near Trenton Junction. Geo. Q. Lowell, chrmn. com. bd. freeholders.

PARKS.

Gloucester, Mass.—The purchase of lands for a park is contemplated, according to recent press reports.

Lafayette, N. J.—A park is to be established at the head of Lafayette-st., which will be 400x460 feet.

Holland, Mich.—The question of issuing $4,000 bonds for park purposes will be voted on April 4. Wm. Van Eyck, cy. clk.

Lewiston, Me.—South Portland desires to condemn a piece of land lying on Wharf Point, Simonton Cove, Willard, for a public park.

Riverside, Cal.—This city contemplates improving a tract of land containing seventy acres, known as the Fairmount tract, for a park.

Los Angeles, Cal.—This city has been presented with a tract of land for park purposes by G. J. Griffith, which will be known as Griffith park.

Cleveland, O.—Plans for a park system and boulevard, to connect Lakeview park with Clinton park, are being prepared by Councilman D. B. Steur. The estimated cost of the improvement is $50,000.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Sewickley, Pa.—Dr. White is a member of the garbage disposal committee.

Aberdeen, Ont.—The question of constructing a garbage crematory is under discussion.

Newport, R. I.—The question of building a garbage crematory is said to be under discussion.

Pittsfield, Mass.—The question of street sprinkling is being discussed by the board of public works.

Atlantic City, N. J.—The city council is said to have engaged Thos. Dark of Buffalo to prepare plans for a crematory.

Alexandria, Va.—The Sicardi Street Cleaning Co. has been incorporated by Chas. Bendheim of Alexandria and Giovanni Sicardi.

Milwaukee, Wis.—An ordinance has been passed by the common council authorizing the issue of bonds for building a municipal garbage disposal plant.

Philadelphia, Pa.—The Philadelphia Incinerating Co. has been incorporated by John M. Mack, James M. Mack, A. M. Slack, Thos. Parker and others.

Trenton, N. J.—Bids are asked until April 5 for the collection, removal and cremation of garbage in the Twelfth ward. S. Edward Murray, cy. clk.

Easton, Pa.—This city has determined to create a department of street cleaning. The removal of garbage may be contracted for this year.

Alameda, Cal.—A proposition has been submitted to the trustees by the National Sanitation Co. to collect and dispose of the garbage of this city.

Troy, N. Y.—A resolution has been adopted authorizing the Contracting Board to readvertise for bids for cremation and disposing of the garbage and ashes.

Chicago, Ill.—As a result of Judge Tuley's decision declaring invalid the five-year

garbage contracts made last year, L. E. McGann, comr. pub. wks., has decided to have the city collect and dispose of the garbage.

Omaha, Neb.—Press reports of March 9 say that "it is safe to say that the majority of the members of the present council would now vote for the purchase of at least one street sweeper if the matter were brought up."

St. Louis, Mo.—The contract for sweeping the street by machine for a period of three years, from March 1, was awarded to the Metropolitan Improvement company at 26 cts. per 10,000 sq. ft. brick and asphalt, and 25 cts. for granite and wood.

St. Paul, Minn.—Bids will be opened April 4 for sweeping the asphalt paved streets. The specifications provide that there shall be no sub-letting of contracts. There are forty-three districts. The wagons, brushes and bags will be furnished by the city without expense to the contractors.

Toledo, O.—D. J. O'Hara has been awarded the contract for collecting the garbage for five years, at $12,000 a year. Press reports of March 21 say that City Auditor Mills will endeavor to enjoin the city from contracting with him, but no reason is given for the action. The Smead Crematory & Paver Co. has been incorporated by H. W. Compton, Frank Gorman, F. L. Fuller, A. K. Detweiler and Geo. B. Bone.

Omaha, Neb.—Andrew Rosewater, cy. engr., has manufactured a street cleaning apparatus, which, with two men and a team of horses, is doing the work of fifty men. The machine is a piece of oak lumber 4x6 inches and eight feet long, with the lower edge protected with a steel knife. The tongue is attached to an iron circle, which allows it to be fixed at any angle, and while the apparatus is useless on stone block, it cleans the brick and asphalt very satisfactorily. It takes all the dirt and refuse from the middle of the street to the gutter, where it is easily shoveled into wagons and hauled away.

Indianapolis, Ind.—Sealed proposals will be received April 6 for sprinkling certain streets and alleys embraced in Dist. No. 23 for the season of 1898, commencing April 1 and ending Nov. 1. Contracts for the city sprinkling were awarded March 16, as follows: F. Kennington—Dist. 1, $17.70; Dist. 2, $18.95; Dist. 22, $16.70, for 10,000 sq. yds; Fuehring Bros.—Dist. 4, $26; Dist. 6, $21.50; Dist. 7, $18; H. Nolting—Dist. 8, $18.50; Henry Prange, Dist. 9, $24.25; Sanford P. Hamilton, Dist. 10, $23.45; F. W. Nolting—Dist. 11, $22; Dist. 15, $19.70; Dist. 17, $18.70; Dist. 18, $22; Rust & Roepke—Dist. 19, $18.20; Dist. 21, $18.20.

TOO LATE FOR CLASSIFICATION.

Louisville, Ky.—The board of public works has decided upon a plan for repairing the streets, which is to take the top coating of broken stone off the street needing repairs, sprinkle a layer of sand over the bed and then put down a layer of brick on edge, to be covered with cement and sand.

Albany, N. Y.—A road improvement bill is before the legislature which is similar to the one in force in New Jersey and some other states. The bill provides for road construction at the joint expense of state, county and town, the state paying 50 per cent., the county 35 per cent. and the town 15 per cent.

Baltimore, Md.—A bill has been introduced by Senator Williams for building better roads, by providing for a report in 1900 by the Geological Commission in reference to the condition and construction of roads. A bill was presented by Senator Bouic providing that one-third or more of the road tax of Montgomery county be used in making macadamized roads.

Newark, N. J.—A decision was filed, March 14, by Judge Child, in the Belmont ave. assessment case, in favor of the property owners, whose contention was that the assessments were not fair and just. Judge Child refers the case back to the commissioners, with instructions that they proceed to make a carfeful examination to ascertain the extent of the area of benefits, and having done this, they then proceed to a careful examination of each and every piece of property said to be peculiarly benefited.

Salinas, Cal.—The Spreckles Sugar Co. will soon begin the construction of a sewerage system at its sugar factory on townsite property, which will, when completed, be one of the finest and most complete systems in the state. The whole system will contain about 17,000 ft. of pipe and will empty into the Salinas river.

Beaver Falls, Pa.—The Peoples' Water Co., which secured a franchise recently, has awarded contracts to the National Foundry & Pipe Works of Scottdale, Pa., for furnishing all pipe for the new works, and with Frinkhouser & Coates of New Brighton, Pa., for laying the same. The contracts for pumps, reservoir, etc., have not been let.

Elkhart, Ind.—An injunction has been issued against the mayor and city council of this city by C. L. Kinney to prevent them from closing a contract with C. D. Budd, of St. Louis, for over $50,000 worth of street paving. C. L. Kinney was one of the fifteen bidders, and, according to the tabulation of the bids as submitted by the street committee, C. D. Budd was next to the lowest bidder and Kinney next above Budd on the whole bid. The work was divided into four divisions, when Kinney was found to be lower than Budd on all but one, but the aggregate was in Budd's favor. The lowest bidder, which was an Ohio firm, was not regarded as desirable, and was not considered. At a meeting of the council a motion to award the entire contract to Budd was made, and another member moved to amend by giving Kinney the three jobs on which he was the lowest bidder, and Budd the other one. On voting for the amendment it was declared lost, because it did not have the two-thirds majority. The orginal motion then prevailed by a vote of 8 to 3. The petition for an injunction is based on this ruling and on the further claim that a revision of the computation makes his four bids, in the aggregate, lower than Contractor Budd's.